CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

Malaysia Biomass Power Plant Project

Version: 2.3
Date completed: 05/12/2012

A.2. Description of the programme of activities:

Based on the comprehensive econometric model study conducted by Gan & Li[1] on the long term outlook of Malaysia's economy, energy and environment, Malaysia's total primary energy consumption will triple by 2030 along with its carbon emissions. The same study also projected that utilization of renewable energy is a strategic option to improve long-term energy security and environmental performance; however, substantial governmental involvement and support and establishment of a regulatory framework is necessary.

Malaysia's electricity demand has grown robustly between 1990 and 2005, from 19.9 TWh (terawatt hours) in 1990 to 80.8 TWh in 2005 (9.8% annually); it is expected to continue to grow between 2005 and 2030 at a rate of 4.5% annually, requiring 245.1 TWh electricity by year 2030[2]. While the demand for electricity is increasing, oil reserves are estimated to decline, with projected oil imports of 23.4 MToe (million tonnes of oil equivalent) by 2030, from net exports of 12.5 MToe in 2005[3].

Renewable energy sources could contribute significantly to the future energy demand. They are potentially secure, sustainable, and low in greenhouse gas emissions. However, although renewable energy resources are abundant, one major obstacle to greater use has been the ineffectiveness of the conversion technologies, which had made renewable energies costly relative to conventional energy. Biomass is expected to be one of the main resources for renewable electricity generation; it is carbon neutral in its lifecycle and provides a clean, renewable energy source that could dramatically improve the environment, economy and energy security[4]. In 2005 biomass generated electricity amounted to approximately 124.2 TWh in APEC, and is projected to reach 208.2 TWh in 2030[5].

Malaysia has abundant biomass waste from its oil palm, wood and agro-industries. If all the residues from these main sources (20 million tonnes), combined with palm oil mill effluent (31 million m^3), 665 MW worth of power generation and co-generation would be available[6]. Under the Tenth Malaysia Plan 2011 – 2015, the Renewable Energy Policy and Action Plan is to be undertaken to achieve a renewable energy target of 985 MW by 2015, contributing 5.5% to Malaysia's total electricity generation mix,

[1] PeckYean Gan and ZhiDong Li. An econometric study on long-term energy outlook and the implications of the renewable energy utilization in Malaysia. Energy Policy, Volume 36, Issue 2, February 2008, Pages 890 - 899

[2] APEC Energy Demand and Supply Outlook, Volume 1, 4th Edition, Table 4.1

[3] APEC Energy Demand and Supply Outlook, Volume 1, 4th Edition, Table 5.1

[4] M.A.A. Mohammed *et al*. Hydrogen rich gas from oil palm biomass as a potential source of renewable energy in Malaysia. Renewable and Sustainable Energy Reviews 15 (2011) 1258 - 1270

[5] APEC Energy Demand and Supply Outlook, Volume 1, 4th Edition, page 74, 93

[6] http://eib.org.my/index.php?page=article&item=100,136,142

providing an annual CO_2 avoidance of 3.2 million tonnes[7]. The planned energy capacity for biomass in the mix is targeted at 330MW.

1. General operating and implementing framework of PoA

The Malaysia Biomass Power Plant Project (hereafter referred to as "PoA") is developed by Integra Carbon Sdn Bhd (Integra) as the coordinating and managing entity (CME), and the proposed project activity will reduce greenhouse gas emissions (GHGs) through the installation of biomass residue (co-)fired power-only power plants[8]. The power-only plants eligible for this PoA are planned to utilize biomass residues only, be it a Greenfield power project(s), power capacity expansion project(s), energy efficiency improvement project(s) (which can also lead to a capacity expansion), retrofitting of existing plant to use biomass, and fuel switch project(s).

Each CDM Programme Activity (CPA) will consist of power-only plant(s) and the power-only plant(s) owner (be it project developer/ project investor/ project participant) will sign a contractual agreement with GenPower Carbon Solutions L.P. prior to being included into the Programme of Activities (PoA). CME will provide the complete CDM service and technical support for management and monitoring of the CPA.

2. Policy/measure or stated goal of the PoA

The main objective of this PoA is to reduce significant amounts of GHG emissions from:

- The electricity produced by carbon intensive resources, e.g. coal, fossil fuels
- Power plants that are less efficient in resource to power conversion
- The biomass residues currently being dumped/ land filled and decaying under anaerobic conditions

This PoA aims to increase renewable energy generation in the energy mix in Malaysia by promoting biomass residue (co-)fired power-only plants, either for power utilization or grid connection. By tapping into the huge power potential of biomass residue, dependency on fossil fuels can be reduced. Based on the Suruhanjaya Performance Report 2009[9], there are currently only two types of biomass residues being utilized for power generation in Malaysia, which are empty fruit bunch and rice husk.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

The proposed PoA is a voluntary action by CME and CPAs will be developed by CME and/or project owner(s). There are no existing regulations in Malaysia enforcing the development of biomass residue (co-)fired power-only plants or utilization of biomass residues in power generation. CME is not obliged by law or any governmental policy to implement the PoA, and CME also does not have any contractual obligation to implement the PoA.

This PoA can support the sustainable development policies of Malaysia and bring about direct benefit towards achieving sustainable development, wherein each CPA will provide social, economic and environmental benefits as listed below:

[7] Tenth Malaysia Plan 2011 – 2015, http://www.epu.gov.my/html/themes/epu/html/RMKE10/img/pdf/en/chapt6.pdf

[8] Terminology of power-only plant as defined in methodology ACM 0018

[9] Performance and Statistical Information on Electrical Supply 2009, Energy Commission Malaysia, Page 168; http://www.st.gov.my/index.php?option=com_phocadownload&view=category&id=10%3Astatistics-electricity&Itemid=4241&lang=en

1. Sustainable development
    - The project activity will contribute to the use of renewable energy sources in power generation and support Malaysia's Fifth Fuel Policy[10]. The project is a means of clean technology for biomass waste managements
    - Processing industries, such as palm oil mills and sawmills, have ready and abundant waste products that require disposal and are a ready source of fuel for renewable energy and are relatively low cost
2. Environmental sustainability
    - The project activity reduces power production based on carbon intensive resources and leads to increased sustainability in the power generation sector from the use of biomass residues, a renewable resource
    - The project activity reduces disposal of biomass residues and increases effective utilization of energy content from the biomass residues
    - The project activity reduces pollution (e.g. emission of greenhouse gases, pungent odors and fire risks) from the anaerobic disposal of biomass residues
3. Social sustainability
    - The project activity will generate new work opportunities in the surrounding areas, as the project activities will mostly occur in remote areas having less opportunity for high paying jobs, and workers will be trained in new technology
    - Consequences of additional energy production will greatly improve standards of living and bring more healthy living conditions, providing easier access to education and health care
4. Economic sustainability
    - Renewable energy will save money in the long term – over the lifetime of the renewable energy equipment, savings on fuel expenditures and revenue from CER sales pays back the cost on investment
    - The project activity will lead to economic spill-over from the project activity by increasing business opportunities for local suppliers in transportation, maintenance and repair, supply of equipment and parts, food and other services
    - Targeted assistance to those who would be facing energy poverty; wherein remote locations without existing energy infrastructure that could prove costly for establishment of normal energy grid would benefit from use of said abundant renewable resources.

A.3. Coordinating/managing entity and participants of POA:

Integra Carbon Sdn Bhd (Integra) will be the coordinating and managing entity for the CPAs under this PoA and will communicate with the Board.

Both GenPower Carbon Solutions, L.P. and Integra Carbon Sdn Bhd is the project participant for this PoA, other project participant(s) (if any) for individual CPAs will be identified in the respective CPA-DDs.

Name of Party involved (*)	Private and/or public entity	Kindly indicate if the Party

[10] 9th Malaysia Plan (9MP) (2006-2010) – Renewable Energy (RE) was announced as the fifth fuel in the energy supply mix in the 8th Malaysian Plan (2001 – 2005) and further reinforced in the 9th Malaysian Plan. RE is targeted to be a significant contributor to the country's total electricity supply and efforts are being undertaken to encourage the utilization of renewable resources, such as biomass, biogas, solar and mini-hydro, for energy generation

((host) indicates a host Party)	(ies) project participants (*) (as applicable)	involved wishes to be considered as project participant (Yes/ No)
Malaysia (host)	Integra Carbon Sdn Bhd	No
United Kingdom of Great Britain and Northern Ireland	GenPower Carbon Solutions, L.P.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

The PoA will cover all states of Malaysia

A.4.1.1. Host Party(ies):

The host party for the PoA is Malaysia

A.4.1.2. Physical/ Geographical boundary:

At the commencement of the PoA, the physical boundary will be within the geographical boundaries of Malaysia. After registration of the PoA, the boundary will be amended for additional countries in accordance with the procedure provided under EB60 Annex 26. The map of Malaysia is shown below.

Figure 1: Map of Malaysia

A.4.2. Description of a typical CDM programme activity (CPA):

A typical CPA will be a biomass residue (co-)fired power-only plant that will implement the project activity by first obtaining biomass residues from biomass residue producers/ market; the biomass residues will then be stored and/or processed (e.g. mechanical treatment, moisture adjustment), prior to being utilized in heat engines (e.g. boiler and turbines) for power generation. Power generated shall be connected either to grid and/or power utilization of the renewable energy.

A.4.2.1. Technology or measures to be employed by the CPA:

Energy in the biomass can be converted to steam, heat, electricity and fuels through various conversion methods, such as direct combustion boiler and steam turbines, anaerobic digestion, co-firing, gasification and pyrolysis[11].

Presently, direct combustion of biomass is the simplest route of energy recovery from the biomass residues; however, suitability of the various combustion technologies available in the market depends on the characteristics of the biomass itself and each CPA will employ individual biomass residue (co-)fired power-only plant technology based on the site conditions and requirements, which shall be discussed in detail in each CPA-DD.

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

The description of eligibility criteria for enrolling the CPA is described as per below, the criteria for demonstrating additionality of CPA shall be described in section E.5

a) All CPA are within the geographical boundary including any time-induced boundary set in the PoA, per section A.4.1.2 of this PoA
b) Each CPA included in this PoA will have a unique identification number as a reference. To avoid double counting, each included CPA with its reference number will be linked with the geographic coordinates of the power plant marked by GPS
c) The applicable projects activities are those that generate electricity in biomass residue (co-)fired power-only plants. The project activity may include the following activities, or where applicable, combinations of these activities:
    (i) The installation of new biomass residues (co-)fired power-only plants at a site where currently no power generation occurs (Greenfield power projects);
    (ii) The installation of new biomass residues (co-)fired power-only plants, which replace or are operated next to existing power-only plants fired with fossil fuels and/or biomass residues (power capacity expansion projects);
    (iii) The improvement of energy efficiency of exiting biomass residues (co-)fired power-only plants (energy efficiency improvement projects), which can also lead to a capacity expansion, e.g. by retrofitting the existing plant;
    (iv) The total or partial replacement of fossil fuels by biomass residues
d) The start date of each CPA will be based on documentary evidence on implementation or construction or real action of the CPA

[11] Anders Evald, and Mohammad Iskandar bin Majidi. Biomass fuels for industrial use – A report prepared under the Malaysian – Danish Environmental Cooperation Programme Renewable Energy and Energy Efficiency Component, performed in Malaysia 2004

e) Each CPA must adhere to the applicability, baseline and monitoring methodology of ACM 0018 "Consolidated methodology for electricity generation from biomass residues in power-only plants" version 02.0.0 methodology or future update;
f) Each CPA to demonstrate the project additionality by applying procedures provided in the procedure for the selection of baseline scenario and demonstration of additionality as stated in the latest version of ACM0018;
g) The PoA-specific requirements stipulated by the CME:
   (i) The CME has approved the participation of the CPA into the PoA (i.e. inclusion form);
   (ii) Local stakeholder meeting shall be conducted at the CPA level;
   (iii) Environmental impact assessment is not required for the implementation of project activity generating power from utilization of biomass residues per the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987;
   (iv) An electricity purchase agreement (example: REPPA for grid connected power agreement) to be signed between project owner and relevant third party (example: Tenaga Nasional Berhad)
h) Each CPA shall provide written affirmation that if there is funding from Annex 1 parties, and that said funding does not result in a diversion of official development assistance
i) The target group is grid connected entities. The distribution mechanism is either by direct installation or contractual installation
j) Each CPA is will be verified individually

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

(i) The proposed PoA is a voluntary coordinated action
   - The proposed PoA is a voluntary coordinated action from CME to promote the implementation of biomass residue (co-)fired power-only generation, either for renewable energy power utilization or grid connection.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA
   - In the absence of the PoA, power generation will continue to utilize carbon intensive resources for power generation and biomass residues will continue to be dumped or land filled, leading to decay under anaerobic conditions.
   - As per the Suruhanjaya Performance Report 2009[12], the generation mix from biomass (consisting of empty fruit bunch, wood chips, rice husk and municipal solid wastes) amounts to only 1.2%, with 58% coming from natural gas and 32.4% from coal. Without the PoA to provide additional CER incentive, use of the biomass residue for power generation is evidently not encouraging. Furthermore, there are no existing mandatory policy/ regulations enforcing biomass residues power-only plants.
   - Therefore, the CDM incentive and renewable energy revenue from the PoA are needed to ensure the viability of the project and attract more voluntary participation.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced
   - The PoA is not implementing a mandatory policy/ regulation

(iv) If mandatory policy/regulations are enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulations

[12] Performance and Statistical Information on Electrical Supply 2009, Energy Commission Malaysia, Page 170;

- Currently there are no existing mandatory policy/ regulations enforcing biomass residue power-only plants. The only existing regulation is on the prohibition of uncontrolled open burning of biomass under the Malaysian Legislation, " Environmental Quality (Declared Activities) (Open Burning) Order 2003"

A.4.4. Operational, management and monitoring plan for the programme of activities:

Integra, as CME of the project activity, will be responsible for the monitoring of the PoA, wherein the operation and maintenance program is to be the responsibility of the project owner of each CPA.

A.4.4.1. Operational and management plan:

The CME will have the following management and arrangement responsibilities related to operations and management:

(i) The CME has a procedure of responsibilities and organization to define the roles and responsibilities of personnel involved in the process of inclusion of CPAs

(ii) The CME will maintain the existing relationship with the CPA implementers and ensure proper training for data monitoring is being provided to CPA implementer

(iii) The CME has established operational and management for the implementation of the PoA, including a record keeping system for each CPA under the PoA that considers:
- Name of the CPA and its unique ID number
- Name of the implementing entity of the CPA
- Contact detail of the implanting entity (contact person, address, telephone and email)
- Location of the CPA (GPS coordinates)
- Relevant technical specification of the CPA

The record keeping will be carried out by using the field instruments, hardware and software installed at every Project site and/or manual data recording in the log book. The captured data will be transferred to the server of CME, which will have provision to archive the data as per individual CPAs.

(iv) The CME will confirm as per EB 55 Annex 38 Paragraph 6(i), that the Project activities included in the CPA is not registered as CPA of another PoA or any other registered CDM Project activity. Declaration from the CPA implementer will be requested.

A.4.4.2. Monitoring plan:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.

Not applicable; CME opt for verification method that verifies each CPA in a transparent manner

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no

double accounting occurs and that the status of verification can be determined anytime for each CPA

The CME opts for each CPA to be verified individually. Baseline and monitoring methodology for each CPA will be developed in accordance with the applied technology utilized, as described in Section E below, at the CPA level. Each CPA is provided with a unique identification number for reference, linked to the geographic coordinates, therefore double counting can be avoided during the verification process.

A.4.5. Public funding of the programme of activities:

The PoA did not obtain nor is seeking any public funding

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

The starting date of the PoA shall be the start of the public comment period (Global Stakeholder Consultation) of validation

B.2. Length of the programme of activities:

The length of the PoA shall be 28 years

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level ✕

The environmental analysis is to be carried out at the CPA level, as the nature of the individual CPA is unique and site specific. Each CPA will employ individual biomass residue (co-)fired power-only plant technology based on the site conditions and requirements. The impacts are confined to the immediate surroundings of each CPA and will adhere to local/ national legislation as governed by the host country, Malaysia.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The project will not have any adverse environmental impact, including transboundary impacts. Some possible environmental impact on biodiversity, particulate emissions and disposal of solid waste (i.e. ash) can be mitigated by ensuring boiler and environmental legislations are strictly enforced[13].

In addition, the activity does not fall under those criteria that would require an Environmental Impact Assessment (EIA) by the host country, Malaysia[14].

Conversely, the project will provide the following environmental benefits:

1. Generation of renewable energy
2. Reduction of carbon intensive fuel source for power plants
3. Effective use of biomass residues
4. Reduction of greenhouse gas emissions from decay and landfill of biomass residues and utilization of carbon intensive fuel sources for power plants

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

In accordance with the host country's environmental regulations, the "Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) order 1987", an environmental impact assessment (EIA) is not required for a typical project activity generating power from utilization of biomass residues.

SECTION D. Stakeholders' comments

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at CPA level ☒

By having the stakeholder consultation at the CPA level, a targeted group of local stakeholders can be reached. Furthermore, the individual CPA geographical location and stakeholder group is unique and different, thus by holding the local stakeholder consultation at the CPA level, this will ensure full participation and consultation of local stakeholders for each participating CPA of the PoA. Each CPA-DD will provide a summary of the comments received and describe how due account was taken for any of the comments received, as applicable.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

This will be addressed at the CPA level

[13] Anders Evald, and Mohammad Iskandar bin Majidi. Biomass fuels for industrial use – A report prepared under the Malaysian – Danish Environmental Cooperation Programme Renewable Energy and Energy Efficiency Component, performed in Malaysia 2004

[14] Environmental quality (prescribed activities) (EIA) order 1987

D.3. Summary of the comments received:

This will be addressed at the CPA level

D.4. Report on how due account was taken of any comments received:

This will be addressed at the CPA level

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical CPA.

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

The approved baseline and monitoring methodology applied to a CPA included in this PoA is ACM0018 ver. 02.0.0: Consolidated methodology for electricity generation from biomass residues in power-only plants

The CME will follow the guidelines in accordance to Annex 38 of EB 55, which laid out “Procedure for Registration of a Programme of Activities as a Single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities” and “Implications of an approved methodology being put on hold or withdrawn”.

Revisions are not required where a methodology is simply revised, without initially having been placed on hold or withdrawn.

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

The methodology is applicable to project activities that generate electricity in biomass residue (co-)fired power-only plants. The project activity may include the following activities or, where applicable, combinations of these activities:

- The installation of new biomass residue (co-)fired power-only plants at a site where currently no power generation occurs (Greenfield power projects);
- The installation of new biomass residue (co-)fired power-only plants, which replace or are operated next to existing power-only plant fired with fossil fuels and/or biomass residues (power capacity expansion projects);
- The improvement of energy efficiency of existing biomass residue (co-)fired power-only plants (energy efficiency improvement projects), which can also lead to a capacity expansion, e.g. by retrofitting the existing plant;
- The total or partial replacement of fossil fuels by biomass residues in an existing power-only plant or in a new power-only plant that would have been built in the absence of the project (fuel switch projects), e.g. by increasing the share of biomass residues use as compared to the baseline, by retrofitting an existing plant to use biomass residues, etc.

The biomass residues used in the project activity may be produced on-site (e.g. if the project activity is based on the operation of a power plant located in an (agro-)industrial plant generating the biomass residues), or they can be obtained off-site from the nearby area, specific suppliers or purchased from a market.

The methodological applicability is listed as per below:

Requirement for applicability of methodology	Compliance of CPA with the given requirement
1) No other biomass types than biomass residues, as defined in methodology are used in the project plant[15]	Project activity only uses biomass residues, as defined in the methodology, in the project plant
2) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 80% of the total fuel fired on an energy basis	Any fossil fuel co-fired in the project plant shall be monitored *ex-post* and will not exceed 80% of the total fuel fired on an energy basis
3) For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs etc) or in other substantial changes (e.g. product change) in this process	For projects that use biomass residues from a production process, implementation of the project activity shall not result in the increase of the processing capacity of raw input, or other substantial changes in the production process
4) The biomass residues used by the project facility should not be stored for more than one year	The storage period of the biomass residues used by the project activity will not be stored for more than one year
5) Projects that chemically process the biomass residues prior to combustion (e.g. by means of esterification, fermentation and gasification) are not eligible under this methodology. The biomass residues can however be processed physically such as by means of drying, pelletization, shredding and briquetting.	Biomass residues shall not be processed chemically prior to combustion. However, if there are physical processes required prior to combustion, they shall be described *ex ante* and monitored *ex post*
6) No power and heat plant operates at the project site during the crediting period	The project activity is a power-only plant during the crediting period
7) If any heat is generated for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the heater to feed thermal loads in the process) during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the following conditions should apply: a) The implementation of the project activity does not influence directly or indirectly the operation of the heat generation	If any heat is generated for purposes other than power generation during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the following conditions will be applied: • The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment; • The heat generation equipment does not influence directly or indirectly the operation of the project plant; and

[15] Refuse Derived Fuel (RDF) may be used in the project plant but all carbon in the fuel, including carbon from biogenic sources, shall be considered as fossil fuel

equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; b) The heat generation equipment does not influence directly or indirectly the operation of the project plant (e.g. no fuels are diverted from the heat generation equipment to the project plant); and c) The amount of fuel used in the heat generation equipment can be monitored and clearly differentiated from any fuel used in the project activity	• The amount of fuel used in the heat generation equipment can be monitored and clearly differentiated from any fuel used in the project activity
8) In the case of fuel switch project activities, the use of biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in: a) The retrofit or replacement of existing heat generators/boilers; or b) The installation of new heat generators/boilers; or c) A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); d) Equipment for preparation and feeding of biomass residues	In the case of fuel switch project activities, the requirement of capital investment shall be evaluated and determined in: • The retrofit or replacement of existing heat generators/boilers; or • The installation of new heat generators/boilers; or • A new dedicated biomass residues supply chain established for the purpose of the project; • Equipment for preparation and feeding of biomass residues

The methodology is only applicable if the most plausible baseline scenario, as identified per the “Procedure for the selection of the baseline scenario and demonstration of additionality” section hereunder, is:

- For power generation: Scenarios P2 to P7, or a combination of any of those scenarios;
- For biomass use: Scenarios B1 to B8, or a combination of any of those scenarios. However, note that for scenarios B5 to B8, leakage emissions should be accounted for as per the procedures of the methodology.

E.3. Description of the sources and gases included in the CPA boundary

The extent of the CPA boundary as per the ACM 0018 version 02.0.0 and subsequent versions is as follows:

1. The project activity power-only plant(s);
2. All other on-site power-only plants, whether fired with biomass residues, fossil fuels or a combination of both;
3. All power plants connected physically to the electrical system (grid) that the project plant is connected to;

4. If applicable, the means of transportation of biomass residue to the project site;
5. If applicable, the site where the biomass residues would have been left for decay or dumped;
6. If the biomass residues involve any type of processing prior to combustion such as drying, pelletization, shredding, briquetting, etc., two options can be considered. The biomass residue processing plant can be included in the project boundary and the primary source of the biomass residues is assessed according to the procedures described in the following section. Or else, the biomass residue processing plant is not included in the project boundary and then the processed biomass obtained from that plant should be considered as alternative B8 in the following section;
7. If applicable, the wastewater treatment facilities used to treat the wastewater produced from the treatment of biomass residues.

The specific situation of the project activity shall be detailed in the CDM Programme Activity Design Document (CDM-CPA-DD), documenting the following:

- For each power plant that has been operating at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the power plant, the types and quantities of fuels which have been used in the power plant during the most recent three years prior to the start of the project activity, and whether the plant continues operation after the start of the project activity;
- For each boiler or other heat generation equipment that has been operating at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the equipment, the types and quantities of fuels which have been used in the equipment during the most recent three years prior to the start of the project activity, and whether the equipment continues operation after the start of the project activity;
- For each power plant installed under the project activity: the type and capacity of the power plant, and the types and quantities of fuels which are planned to be used;
- For each power plant that would be installed in the absence of the project activity: the type and capacity of the power plant and the types and quantities of fuels which would be used.

The gases and sources relevant to the CPA are listed below based on the ACM0018 version 02.0.0 methodology and subsequent versions.

Table 1: Overview on emission sources included in or excluded from the project boundary

	Source	**Gas**		**Justification/ Explanation**
Baseline	Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF[16] sector
		CH_4	To be decided by CPA	CPA may decide to include this emission source, where case B1, B2 or B3 has been identified as the most likely baseline scenario
		N_2O	Excluded	Excluded for simplification. This is conservative
	Source	**Gas**		**Justification/ Explanation**
A	On-site fossil fuel	CO_2	Included	May be an important emission source

[16]LULUCF – Land Use, Land-Use Change and Forestry

	consumption	CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	On-site and off-site transportation and processing of biomass residues	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Combustion of biomass residues for electricity	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Included or excluded	This emission source must be included if CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are included
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Wastewater from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Included	This emission source shall be included in cases where the waste water is treated (partly) under anaerobic conditions
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Due to the differing nature of power generation from biomass residues in power-only plants applicable under ACM0018, each CPA will be provided with description of how the baseline scenario for that CPA is identified.

The baseline scenario shall be separately determined for electricity generation and biomass residue utilization.

For power generation: Scenarios P2to P7, or a combination of any of those scenarios:

P2: If applicable, the continuation of power of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site; then the

existing power-only plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the project activity;

P3: If applicable, the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, then the existing power-only plants would operate with different conditions from those observed in the most recent three years prior to the project activity;

P4: If applicable, the retrofitting of existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site; then the retrofitting may or may not include a change in fuel mix;

P5: Generation of power in the grid;

P6: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using the same amount or less biomass residues than under scenario P1;

P7: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using more biomass residues than under scenario P1.

For biomass use: Scenarios B1 to B8, or a combination of any of those scenarios:

B1: The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;

B2: The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills which are deeper than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;

B3: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;

B4: The biomass residues are used for electricity generation in power-only plant configuration at the project site in new and/or existing power plants;

B5: The biomass residues are used for power and/or heat generation in other existing or new power plants at other sites;

B6: The biomass residues are used for other energy purposes, such as the generation of bio-fuels;

B7: The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry);

B8: The primary source of the biomass residues and/or their fate in the absence of the project activity cannot be clearly identified.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA):

There are no mandatory regulations and requirements to utilize biomass for the generation of power. The common practice in the power generation industry is to use carbon rich fuel sources for power generation and current practice for the disposal of biomass is either dumping or being left to decay.

Investment is required to implement the biomass residue (co-)fired power-only plants. The possible return from generation of electricity is small compared with operational use of biomass combustion for power generation. As the implementation cost of the project is great compared to the current proven technology of generating power, and the low/ no cost disposal of biomass; the project activity will only be implemented if revenue from certified emission reductions (CERs) can supplement other income sources.

In addition, implementation of the biomass residue (co-)fired power-only plant projects needs voluntary coordination from the CME, as the baseline scenario is likely to continue, using carbon rich fuel sources for power generation; biomass will continue to be dumped or left to decay. The PoA is thus implementing a voluntary coordinated action not required by legislation, which would not be implemented in the absence of this PoA.

E.5.1. Assessment and demonstration of additionality for a typical CPA:

The baseline scenario is identified and established on a project-specific basis for each CPA and will be described in detail in the CDM Programme Activity Design Document (CDM-CPA-DD). The baseline scenario will be investigated during the feasibility study of each CPA in the planning stage or before any project activity decision is confirmed. The identified baseline shall be in accordance with the procedures provided in the procedure for the selection of baseline scenario as stated in the latest version of ACM0018.

The selection of baseline scenario and demonstration of additionality is conducted by applying the following steps:

Step 1: Identification of alternative scenarios
Step 1a: Define alternative scenarios to the proposed CPA project activity
The alternative baseline scenarios shall be separately determined regarding:

- How electric power will be generated in the absence of the CDM project activity; and
- What would happen to the biomass residues in the absence of the project activity

List of alternative scenarios for electric power:

Alternative	Description
P1	The proposed activity not undertaken as a CDM project activity
P2	If applicable[17], the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the project activity
P3	If applicable[22], the continuation of power generation in existing power-only plants fired with biomass residues, of fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate with different conditions from those observed in

[17] This alternative is only applicable if there are existing power plants operating at the project site

	the most recent three years prior to the project activity
P4	If applicable[22], the retrofitting of existing power-only plant fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The retrofitting may or may not include a change in fuel mix
P5	The generation of power in the grid
P6	The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using the same amount or less biomass residues than under scenario P1
P7	The installation of a new power-only plants fired with biomass residues, or fossil fuels, or a continuation of both, at the project site, using more biomass residue than under scenario P1

When defining plausible and credible alternative scenarios for power generation, the guidance below shall be strictly followed:

- For any of the alternative scenarios described above, all assumptions with respect to installed capacities, load factors, energy efficiencies, fuel mixes, and equipment configuration, shall be clearly described and justified in the CDM-CPA-DD. The justification for existing plants should be based on the existing conditions of the plants and the justification for new plants, or changes to existing plants, should be based on design parameters selected considering realistic and credible alternative design options;
- The whole electricity generation under the project scenario, at the project site, will be considered. Therefore, wherever the project activity involves an increase in installed power generation capacity, an increase in electricity generation, and/or a change in electricity demand as compared to the historical situation, the baseline scenario will be determined for the overall power generated under the project activity, possibly including a combination of different scenarios described above. This will be particularly relevant for cases in which existing power plants have operated at the project site prior to the implementation of the project activity;
- In cases where alternative scenarios include the installation of new power generation facilities at the project site other than the proposed project activity, the economically most attractive technology and fuel mix should be identified among those which provide the same service (i.e. the same power quantity), that are technologically available and that are in compliance with relevant regulations. The efficiency of the technology and the fuel type should be selected in a conservative manner, i.e. where several technologies and/or fuel types could be used and are similarly economically attractive, the least carbon intensive fuel type/ the most efficient technology should be considered. Ensure that the selected technology represents at least the common practice for new power plants in the respective industry sector, in the country or region, excluding CDM registered projects[18];
- If a power plant was already operating at the project site prior to the implantation of the project activity, it could be retired at the start of the project activity because it is replaced by the project plant, or it may initially be operated in parallel to the project plant and be retired at a future point in time (at the end of its lifetime). In such cases, the remaining technical lifetime of the existing equipment has to be determined and a baseline based on historical performance only applies until the existing power plant would have been replaced or retrofitted in the absence of the project activity. From that point of time, a different baseline shall apply. The project participant shall determine the age and the average technical lifetime of any existing power plant, taking into

[18] In case all similar plant are registered as CDM project activities, this assessment of common practice is not required (as per footnote 3 of ACM0018 ver. 02.0.0, page 8/57)

account common practices in the sector and country. The average technical lifetime may be determined based on industry surveys, statistics, technical literature or the practices of the responsible company regarding replacement schedules, e.g. based on historical replacement records for similar equipment the average technical lifetime should be chosen in conservative manner, i.e. the earliest point in time should be chosen in cases where only a time frame can be estimated, and should be documented and justified in the CDM-CPA-DD;

- If the project activity supplies electricity partially or fully to (a) captive consumer(s), then alternatives considered for power generation should only include alternatives that can be implemented at the project site (e.g. P1, P2, P3, P4, P6 or P7) or the purchase of electricity from the grid (P5) but not the generation of power in plant established by the project participant at other locations;
- If the project activity is the establishment of a Greenfield power plant and supplies electricity only to the grid, then the alternatives considered for power generation should include only the scenarios P1 and P5. In this case, it can be considered that the electricity delivered by the project activity would have otherwise been generated by the operation of existing or new grid-connected power plants, established either by the project participant and project participant or by third parties.

List of alternative scenarios for use of biomass residue:

Alternative	Description
B1	The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues in fields
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions, in landfills which are deeper than 5 meters. This does not apply to biomass residues that are stock piled or left to decay on fields
B3	The biomass residues are burned in an uncontrolled manner without utilizing it for energy purposes
B4	The biomass residues are used for electricity generation in power-only plant configuration at the project site in new and/or existing power plants
B5	The biomass residues are used for power and/or heat generation in other existing or new power plants at other sites
B6	The biomass residues are used for other energy purposes, such as the generation of bio-fuels
B7	The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)
B8	The primary source of biomass residues and/or their fate in the absence of the project activity cannot be clearly defined[19]

When defining plausible and credible alternative scenarios for the use of biomass residues, the guidance below shall be strictly followed:

- If the biomass residues involve any type of processing prior to combustion such as drying, pelletization, shredding, briquetting, etc., two options can be considered. The biomass residues processing plant is included in the project boundary and the primary source of the biomass residues is assessed according to the procedures described in this section. Therefore, if pellets are

[19] For example, this scenario can be used if biomass residues are purchased from a market, or biomass residues retailers, or if processed biomass is purchase from biomass processing plants which are not included in the project boundary

used in the project activity and the pelletization plant is included in the project boundary, the biomass residues used as raw material for the production of pellets have to be assessed using the procedures described herein. Otherwise, if the biomass residues processing plant is not included in the project boundary then the processed biomass obtained from that plant should be considered as B8 above;

- The baseline scenario for the use of biomass residues should be separately identified for different categories of biomass residues, covering the whole amount of biomass residues supposed to be used in the project activity along the crediting period, and consistent with the alternative scenarios selected for power generation (Scenarios P above);
- A category of biomass residues is defined by three attributes: (1) its type (i.e. bagasse, rice husks, empty fruit bunches, etc); (2) its source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc); and (3) its fate in the absence of the project activity (Scenarios B above);
- Explain and document transparently in the CDM-CPA-DD, in a table form (similar to that of Table 2 in ACM0018 ver. 02.0.0: example of a table for biomass residues categories), which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. For the selection of the baseline scenario and demonstration of additionality, at the validation stage, an *ex ante* estimation of the quantities will be provided. The quantities will be updated every year of the crediting period as part of the baseline and monitoring methodology so as to reflect the actual use of biomass residues in the project scenario. These updated values are to be used for emission reductions calculations. Along the crediting period, new categories of biomass residues (i.e. new types, new sources, with different fate) can be used in the project activity. In this case, a new line will be added to the table;
- For biomass residues categories for which scenarios B1, B2 or B3 is deemed a plausible baseline alternative, project participant shall demonstrate that this is a realistic and credible alternative scenario. Towards this end, for each biomass residues category, one of the following procedures should be applied:
    a) Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of that type of biomass residues available in the region is at least 25% larger than the quantity of biomass residues of that type which is utilized in the region (e.g. for energy generation or as feedstock), including the project plant;
    b) Demonstrate for the sites from where biomass residues are sourced that the biomass residues have not been collected or utilized (e.g. as fuel fertilizer or feedstock) but have been dumped and left to decay, land-filled or burnt without energy generation (e.g. field burning) prior to their use under the project activity. This approach will be applicable to biomass residues categories for which the project participant can clearly identify the site from where the biomass residues are sourced.

The scenarios B1, B2 or B3 can only be regarded as a plausible baseline scenario for a certain category of biomass residues, if the project participant can demonstrate that at least one of the two approaches (a) or (b) are fulfilled. Otherwise, the baseline scenario for this particular biomass residues category should be considered as B8, and a leakage penalty will be applied when calculating leakage emissions.

If during the crediting period, new categories of biomass residues of the type B1, B2 or B3 are used in the project activity which were not listed at the validation stage, e.g. due to new sources of biomass

residues, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in this guidance for each category of biomass residues.

For the purpose of identifying relevant alternative scenarios, project participant will provide an overview of other technologies or practices that provide outputs or services with comparable quality, properties and application area as the proposed CDM project activity and that have been implemented previously or are currently underway in the relevant geographical area. The relevant geographical area should in principle be the host county of the proposed CDM project activity. A region within the county could be the relevant geographical area if the framework conditions vary significantly within the county. However, the relevant geographical area should include preferably ten facilities (or projects) that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity. If less than ten facilities (or projects) that provide outputs or services with comparable quality, properties and application area as the proposed CDM project activity are found in the region/ host county, the geographical area may be expanded to an area that covers if possible, ten such facilities (or projects). In cases where the above described definition of geographical area is not suitable, the project participant will provide an alternative definition of geographical area. Other registered CDM project activities are not to be included in this analysis. Relevant documentation to support the results of the analysis shall be provided.

The project participant shall identify realistic combinations of scenarios for electric power generation and use of biomass residues.

Sub-step 1b: Consistency with mandatory applicable laws and regulations
From the list of plausible alternative scenarios to the project activity, the project participant shall ensure that the alternative(s) are in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objective other than GHG reductions, e.g. to mitigate local air pollution. National and local policies that do not have legally-binding status are not considered.

If an alternative does not comply with all mandatory applicable legislation and regulations, then project participant shall show, based on an examination of current practice in the country or region in which the mandatory law or regulation applies, those applicable mandatory legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread in the country. If this cannot be shown, then the alternative is eliminated from further consideration.

If the proposed activity is the only alternative amongst the ones considered by the project participant that is in compliance with all mandatory regulations with which there is a general compliance, then project participant shall conclude that the CDM project activity is not additional and will not include the project activity into the PoA.

Step 2: Barrier analysis
This step serves to identify barriers and to assess which alternatives are prevented by barriers.

Sub-step 2a: Identify barriers that would prevent the implantation of alternative scenarios
Establish a complete list of realistic and credible barriers that may prevent alternative scenarios to occur.

- Investment barriers
    - For alternatives undertaken and operated by private entities: similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a

  - similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant geographical area;
  - No private capital is available from domestic or international capital markets due to real or perceived risks associated with investments in the country where the project activity is to be implemented, as demonstrated by the credit rating of the county or other county investment reports of reputed origin
- Technological barriers
  - Skilled and/or properly trained labour to operate and maintain the technology is not available in the relevant geographical area, which leads to an unacceptably high risk of equipment disrepair, malfunctioning or other underperformance
  - Lack of infrastructure for implementation and logistics for maintenance of the technology (e.g. natural gas can not be used because of the lack of a gas transmission and distribution network);
  - Risk of technological failure: the process/ technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activities, as demonstrated by relevant scientific literature or technology manufacturer information;
  - The particular technology used in the proposed project activity is not available in the relevant geographical area
- Lack of prevailing practice
  - The alternative is the "first of its kind"
- Other barriers

Sub-step 2b: Eliminate alternative scenarios which are prevented by the identified barriers
Identify which alternative scenarios are prevented by at least one of the barriers listed in sub-step 2a, and eliminate those alternative scenarios from further consideration. All alternative scenarios shall be compared to the same set of barriers. The assessment of the significance of barriers should take into account the level of access to and availability of information, technologies and skilled labour in the specific context of the industry where the project type is located.

In applying sub-step 2a and 2b, provide transparent and documented evidence, and offer conservative interpretations of this evidence, as to how it demonstrates the existence and significance of the identified barriers and whether alternative scenarios are prevented by these barriers. The type of evidence to be provided should include at least one of the following:

(a) Relevant legislation, regulatory information or industry norms;
(b) Relevant (sectoral) studies or surveys (e.g. market surveys, technology studies, etc) undertaken by universities, research institutions, industry association, companies, bilateral/ multilateral institutions, etc;
(c) Relevant statistical data from national or international statistics;
(d) Documentation of relevant market data (e.g. market prices, tariffs, rules);
(e) Written documentation from the company or institution developing or implementing the CDM project activity or the CDM project developer, such as minutes from Board meetings, correspondence, feasibility studies, financial or budgetary information, etc;
(f) Documents prepared by the project developer, contractors or project partners in the context of the proposed project activity of similar previous project implementations;
(g) Written documentation of independent expert judgement from industry, educational institutions (e.g. universities, technical school, training centers), industry associations and others.

Step 3: Investment analysis
The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The analysis should include all alternative scenarios remaining after Step 2, including scenarios where the project participants do not undertake an investment (e.g. combination of B1 and P5).

Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g. levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context. If one of the alternative scenarios remaining after Step 2 corresponds to the situation where the project participants do not undertake any investment, then use either the NPC or the IRR as financial indicator in the analysis.

Calculate the suitable financial indicator for all alternative scenarios remaining after Step 2. Include all relevant costs (including, for example, the investment cost, the operations and maintenance cost), and revenues (including subsidies/ fiscal incentives[20], ODA, etc. where applicable), and, as appropriate, non-market costs and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.

For an alternative which does not involve any investment by the project participants, use the following values for the financial indicator:

- If the financial indicator is the NPV: assume a value of NPV equal to zero;
- If the financial indicator is the IRR: use as the IRR the financial benchmark, as determined through the options (a) to (e) below.

The financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. In the particular case where the project activity can only be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.

The discount rate (in the case of the NPV) or the financial benchmark (in the case of the IRR) shall be derived from:

(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;
(b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;
(c) A company internal financial benchmark (weighted average cost of capital of the company), only in the particular case that the project activity can only be implemented by the project participant. The project developers shall demonstrate that this financial benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same financial benchmark;
(d) A government/officially approved financial benchmark where, it can be demonstrated that such financial benchmarks are used for investment decisions;

[20] Note that according to guidance by the EB (EB 22, Annex 3), subsidies and incentives may be excluded from consideration in certain cases

(e) Any other indicators, if the project participants can demonstrate that the above options are not applicable and their indicator is appropriately justified.

Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the CDM-CPA-DD, or in separate annexes to the PDD, so that a reader can reproduce the analysis and obtain the same results. Refer to critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial indicator, the risks of the alternative scenarios can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents). Assumptions and input data for the investment analysis shall not differ across alternative scenarios, unless differences can be well substantiated.

Present in the CDM-CPA-DD submitted for validation a clear comparison of the financial indicator for all alternative scenarios and rank the alternative scenarios according to the financial indicator.

Include a sensitivity analysis to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment comparison analysis provides a valid argument in identifying the baseline scenario only if it consistently supports (for a realistic range of assumptions) the conclusion that one alternative is the most economically and/or financially attractive.

Step 4: Common practice analysis
The previous steps shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and geographical area. This test is a credibility check to demonstrate additionality which complements the barrier analysis (Step 2) and, where applicable, the investment analysis (Step 3).

Provide an analysis to which extent similar activities to the proposed CDM project activity have been implemented previously or are currently underway. Similar activities are defined as activities (i.e. technologies or practices) that are of similar scale, take place in a comparable environment, *inter alia*, with respect to the regulatory framework and are undertaken in the relevant geographical area, as defined in Sub-step 1a above. Other registered CDM project activities are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant geographical area.

If similar activities to the proposed project activity are identified, then compare the proposed project activity to the other similar activities and assess whether there are essential distinctions between the proposed project activity and the similar activities. If this is the case, point out and explain the essential distinctions between the proposed project activity and the similar activities and explain why the similar activities enjoyed certain benefits that rendered them financially attractive (e.g. subsidies or other financial flows) and which the proposed project activity can not use or why the similar activities did not face barriers to which the proposed project activity is subject.

Essential distinctions may include a serious change in circumstances under which the proposed CDM project activity will be implemented when compared to circumstances under which similar projects were carried out. For example, new barriers may have arisen, or promotional policies may have ended, leading

to a situation in which the proposed CDM project activity would not be implemented without the incentive provided by the CDM. The change must be fundamental and verifiable.

E.5.2. Key criteria and data for assessing additionality of a CPA:

Integra, the coordinating and managing entity will ensure that the proposed CPA is additional and in compliance with the host country's policies and regulations.

Each CPA will demonstrate additionality based on the following criteria for inclusion into the PoA:

- Define credible possible alternative scenarios to the project activity. Ensure that the proposed CPA is not the only alternative amongst those considered and of which is consistent with mandatory laws and regulations;
- Determine most relevant barrier in terms of investment analysis and barrier analysis;
- Employ either simple cost analysis, investment comparison analysis or benchmark analysis to demonstrate that the proposed CPA is unlikely to be the most financially attractive alternative or is unlikely to be financially attractive;
- No similar activities can be observed; or that if similar activities are observed, essential distinctions between the proposed CPA and similar activities can be reasonably explained;
- The CPA participation is voluntary and there is no requirement or enforcement under existing national/ state/ local regulations to enforce implementation of the project activity

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

The following methodologies and tools are selected for a typical CPA (versions which may be updated, as necessary):

- ACM0018 ver. 02.0.0: Consolidated methodology for electricity generation from biomass residues in power-only plants and subsequent versions
- Tool to calculate the emission factor for an electricity system, version 03.0.0
- Emissions from solid waste disposal sites, version 06.0.1
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, version 02
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption, version 01
- Assessment of the validity of the original/ current baseline and update of the baseline at the renewal of the crediting period, version 03.0.1
- Project and leakage emissions from transportation of freight, version 01.1.0

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a CPA:

Emission Reductions:

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(1)}$$

Where:

ER_y emissions reductions during year *y* (tCO_2e)
$BE_{,y}$ baseline emissions during year *y* (tCO_2e)
PE_y project emissions during year *y* (tCO_2e)
LE_y leakage emissions during year *y* (tCO_2e)

Baseline Emissions:
Baseline emissions may, where applicable, include the following emission sources:

- CO_2 emissions from fossil fuel power plants at the project site;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system;
- CH_4 emissions from anaerobic decay of biomass residues and/or CH_4 emissions from uncontrolled burning of biomass residue without utilizing them for energy purposes.

Baseline emissions are calculated as follows:

$$BE_y = BE_{EL,y} + BE_{BR,y} \quad \textbf{(2)}$$

Where:
BE_y baseline emissions in year *y* (tCO_2e)
$BE_{EL,y}$ baseline emissions due to generation of electricity in year *y* (tCO_2e)
$BE_{BR,y}$ baseline emissions due to uncontrolled burning or decay or biomass residues in year *y* (tCO_2e)

Baseline emissions are determined through the following steps:

Step 1: Determination of $BE_{EL,y}$
Baseline emission from electricity generation are calculated based on the net quantity of electricity generated at the project site under the project scenario ($EF_{PJ,y}$) and a baseline emission factor ($EF_{BL,EL,y}$) which expresses the weighted average CO_2 intensity of electricity generation in the baseline, as follows:

$$BE_{EL,y} = EG_{PJ,y} \cdot EF_{BL,EL,y} \quad \textbf{(3)}$$

Where:
$BE_{EL,y}$ baseline emissions due to generation of electricity in year *y* (tCO_2)
$EG_{PJ,y}$ net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EF_{BL,EL,y}$ emission factor for electricity generation in the baseline in year *y* (tCO_2/ MWh)

For this methodology, it is assumed that transmission and distribution loses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for.

Step 1.1: Determination of $EG_{PJ,y}$
The net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary ($EF_{PJ,y}$) is determined as the difference between the gross electricity generation at the project site ($EF_{PJ,gross,y}$) and the auxiliary electricity consumption required for the operation of the power plants at the project site ($EF_{PJ,aux,y}$), as follows:

$EG_{PJ,y}$ is determined as follows:

$$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y} \quad \textbf{(4)}$$

Where:

$EG_{PJ,y}$	net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EG_{PJ,gross,y}$	gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EG_{PJ,aux,y}$	total auxiliary electricity consumption required for the operation of the power plants at the project site (MWh)

$EG_{PJ,aux,y}$ shall included all electricity required on-site for the operation of equipment related to the preparation, processing, storage and transport of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, pelletization, shredding, briquetting processes, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.).

Step 1.2: Determination of $EF_{BL,EL,y}$

The electricity generated under the project activity could be generated in the baseline in three different ways, depending on the baseline scenario and the particular situation of the project activity:

- **Use of biomass residues at the project site.** Electricity could be generated with biomass residues in power plants at the project site. This applies, for example, if
  - (a) The project activity is a replacement of an existing biomass residues fired power plant;
  - (b) The project activity is a capacity expansion of an existing biomass residues fired power plant by installing a new biomass residues fired power plant that is operated next to the existing plant;
  - (c) The project activity is a fuel switch project activity where some biomass residues have already been used prior to the implementation of the project activity;

AND/OR

- **Use of fossil fuels at the project site.** Electricity could be generated with fossil fuels in power plants at the project site. This applies, for example, if
  - (a) The project activity is a fuel switch from fossil fuels to biomass residues;
  - (b) In the baseline, a fossil fuel power plant would continue to operate at the project site in parallel with a new biomass residues power plant;

AND/OR

- **Power generation in the electricity grid.** Electricity could be generated by power plants in the electricity grid. This applies, for example, if
  - (a) The project activity exports all electricity to the grid and no electricity would be produced at the project site in the baseline;
  - (b) The project activity results in an increase of the quantity of electricity produced by power plants included in the project boundary and this increased electricity is exported to the grid or would in the baseline be purchased from the grid.

For some project types, electricity would be generated in the baseline by a combination of these three ways. Therefore, $EF_{BL,EL,y}$ is a weighted average baseline emission factor: it is determined based on each of the three ways electricity could be generated (grid, biomass residues, fossil fuels), multiplied with its respective emission factor over the total amount of electricity produced in the baseline.

In many situations it is difficult to clearly determine the precise mix of grid, biomass residues and fossil fuels based electricity that would be generated in the absence of the project activity. If electricity can be generated in an on-site fossil fuel power plant or can be purchased from the grid, it is particularly challenging to determine how electricity would be generated in the baseline. For example, to what extent

an existing coal power plant is dispatched and to what extent electricity is purchased from the grid can depend on the prices for electricity and coal which changes over time.

For this reason, this methodology adopts a conservative approach and defines four different electricity quantities to be used for the calculation of the weighted average baseline emission factor $EF_{BL,EL,y}$. These four different electricity quantities are $EG_{BL,BR,y}$, $EG_{BL,grid,y}$, $EG_{BL,FF,y}$ and $EG_{BL,FF/grid,y}$:

- $EG_{BL,BR,y}$ corresponds to the amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline;
- $EG_{BL,grid,y}$ correspond to the amount of electricity for which it can be clearly identified that it would be generated in the electricity grid in the baseline. For example, the amount of electricity generated under the project activity that exceeds the amount that could be generated with the capacity of the baseline plants operated at the project site could only be generated in the grid in the baseline;
- $EG_{BL,FF,y}$ corresponds to the amount of electricity for which it can be clearly identified that it would be generated in the baseline with fossil fuels at the project site. For example, in the case of a co-fired boiler operated in the baseline, some fossil fuels may need to be fired for technical or operational reasons;
- $EG_{BL,FF/grid,y}$ corresponds to the amount of electricity that could be generated in the baseline either by power plants in the electricity grid or with fossil fuels at the site of the project activity. As it can not be clearly identified which of these two options would be used in the baseline, the lower CO_2 emission factor between the grid emission factor and the emission factor of fossil fuel power plants operated at the site of the project activity is used for this amount of electricity.

Based on this approach, $EF_{BL,EL,y}$ is calculated as follows:

$$EF_{BL,EL,y} = \frac{EG_{BL,FF,y} \cdot EF_{BL,FF,y} + EG_{BL,grid,y} \cdot EF_{grid,CM,y} + EG_{BL,FF/grid,y} \cdot MIN\left(EF_{BL,FF,y}; EF_{grid,CM,y}\right)}{EG_{BL,BR,y} + EG_{BL,FF,y} + EG_{BL,grid,y} + EG_{BL,FF/grid,y}} \quad \textbf{(5)}$$

Where:

$EF_{BL,EL,y}$	emission factor for electricity generation in the baseline in year *y* (tCO_2/ MWh)
$EG_{BL,BR,y}$	amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline year *y* (MWh)
$EG_{BL,FF,y}$	minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{BL,grid,y}$	minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline year *y* (MWh)
$EG_{BL,FF/grid,y}$	amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year *y* (MWh)
$EF_{grid,CM,y}$	combined margin CO_2 emission factor for grid-connected electricity generation in year *y* (tCO_2/ MWh)
$EF_{BL,FF,y}$	CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline in year *y* (tCO_2/ MWh)

In the following, first the amounts of electricity generated from the various sources in the baseline ($EF_{BL,BR,y}$, $EG_{BL,grid,y}$, $EG_{BL,FF,y}$ and $EG_{BL,FF/grid,y}$) are determined, taking into account the project configuration and the baseline scenario. Therefore, different cases have to be considered. Then the emission factors ($EF_{grid,CM,y}$ and $EF_{BL,FF,y}$) are determined.

Step 1.3: Determination of $EG_{BL,BR,y}$

The amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline ($EG_{BL,BR,y}$) should, in accordance with the baseline scenario and the historical situation before project implementation, be determined as follows:

Case 1: **No power generation with biomass residues in the baseline.** If Scenario B4 does not apply to any biomass residues category (i.e. if no biomass residues would be used for electricity generation in power-only plants in the baseline), then: $EG_{BL,BR,y} = 0$

Case 2: **Power generation with biomass residues in the baseline.** If Scenario B4 applies to all or parts of the biomass residues fired in the power plants (s) included in the project boundary (i.e. if all or parts of the biomass residues would be used in the baseline for electricity generation in power-only plants included in the baseline boundary), then $EG_{BL,BR,y}$ is calculated as follows:

$$EG_{BL,BR,y} = \frac{1}{3.6} \cdot \sum_{n} \sum_{p} \eta_{BL,BR,p} \cdot BR_{BL,n,p,y} \cdot NCV_{n,y} \quad \textbf{(6)}$$

Where:

$EG_{BL,BR,y}$	amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$\eta_{BL,BR,p}$	efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$BR_{BL,n,p,y}$	quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry-basis)
$NCV_{n,y}$	net calorific value of biomass residues of category *n* in year *y* (GJ/ tonnes on dry-bases)
n	biomass residues categories
p	power-only plants at the site of the project activity that would (partly) use biomass residues to generated electricity in the baseline

Determination of $BR_{BL,n,p,y}$

Where case 2 above applies, $BR_{BL,n,p,y}$ has to be determined. The determination of $BR_{BL,n,p,y}$ shall be based on the monitored amounts of biomass residues used in power plant included in the project boundary. The biomass residue quantities used should be monitored separately for (a) each type of biomass residues (e.g. rice husks, sugarcane bagasse, empty fruit bunches, etc.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc). Note that $BR_{BLn,p,y}$ only includes those biomass residues categories which would also be used in the baseline for electricity generation in power-only plants (i.e. for which B4 is the baseline scenario).

Where the whole amount of biomass residue of one particular type and from one particular source would be used in the baseline in only on clearly identifiable baseline power plant *p*, the monitored quantities of biomass residues used in the project ($BR_{PJ,n,y}$) can be directly allocated to their use in the baseline scenario ($BR_{BL,n,p,y}$).

However, the following situations require particular attention:

- One biomass residue type from one particular source could be used in the baseline in two or more power plants *p* (and not only in one power plant) or in different boilers of that power plant. In this case, the use of this biomass residue type from this source has to be allocated to the different baseline power plants *p* or different boilers should they have a different efficiency;

- One biomass residue type from one particular source could have two different fates in the baseline scenario. This can apply, for example, if parts of one biomass residue type were already collected prior to the implementation of the project activity while another part was not needed and thus dumped, left to decay or burnt. In this case, it is necessary to allocate the biomass residue quantity used under the project to the following fates in the baseline scenario:
  (a) Electricity generation in power-only plants (B4);
  (b) Dumping, leaving to decay or burning (B1, B2 and/or B3); or
  (c) As required for the purpose of calculating leakage effects: other fates (B5, B6, B7 and/or B8).

Where one of these arises, the project participant should specify and justify in the CDM-CPA-DD in a transparent manner how the relevant allocations should be made and how $BR_{BL,n,p,y}$ should be determined for the relevant biomass residue category *n* and each power plant *p* based on the monitored quantities. The approaches used should be consistent with the identified baseline scenario and reflect the particular situation or the underlying project activity. In doing so, the following allocation rules should be adhered to:

- The sum of biomass residues used in the baseline in all power plants *p* shall correspond to the total amount of biomass residues which are used under the project activity and for which the baseline scenario is B4:

$$\sum_{n}\sum_{p} BR_{BL,n,p,y} = \sum_{n} BR_{PJ,n,y} \quad \textbf{(7)}$$

Where:

$BR_{BL,n,p,y}$	quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry-basis)
$BR_{PJ,n,y}$	quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis)
n	biomass residues categories for which B4 is the baseline scenario
p	power-only plants at the site of the project activity that would (partly) use biomass residues to generated electricity in the baseline

- The allocation of biomass residue should be undertaken in a conservative manner. This means that in case of uncertainty an allocation rule should favour the option that results in lower emission reductions;
- If several biomass residue plants *p* or several boiler supplying one power plant would operated in the baseline and if it is technically feasible to use a biomass residue type in different power plants *p* or boilers, one of the following two approaches should be applied:
  (a) Assume the most efficient operation mode which results in the greatest amount of electricity generation from biomass residues. For example, it should be assume that first those biomass residues types, boilers and power plant *p* would be used that yield the highest efficiency of power generation, taking into account technical constraints, and that subsequently less efficient biomass residue types of equipment would be used;
  (b) Choose for the determination of $\eta_{BL,BR,p}$ below the same conservative default efficiency for all power plants *p* that would be operated in the baseline at the project. In this case, no allocation of biomass residues to different power plants is required
- In the case a biomass residues type from one particular source has been used prior to the implementation of the project activity partly in power-only plants operated at the project site (scenario B4) and partly has been dumped, left to decay or burnt (scenarios B1, B2, B3) and if this situation would continue in the baseline scenario, then use, as a conservative approach to

address the uncertainty associated with such an allocation, the maximum value among the following two approaches for the quantity of biomass residue allocated to scenario B4:

(a) The highest annual historical use of that biomass residue type from that source in power-only plants operated at the project site observed in the most recent three calendar years prior to the implementation of the project activity; and
(b) In the case of projects that use biomass residues from a on-site production process (e.g. production of sugar cane or rice), calculated as follows:

$$BR_{PJ,n,B4,y} = P_y \cdot MAX\left\{\frac{BR_{n,power-only,x}}{P_x};\frac{BR_{n,power-only,x-1}}{P_{x-1}};\frac{BR_{n,power-only,x-2}}{P_{x-2}}\right\} \quad \textbf{(8)}$$

Where:

$BR_{PJ,n,B4,y}$	quantity of biomass residues of category *n* used in year *y* in power-only plants which are located at the project site and included in the project boundary and for which B4 is the baseline scenario (tonnes on dry-basis)
$BR_{n,power-only,x}$	quantity of biomass residues of category *n* used in year *x* in power-only plants which were used at the project site prior to the implementation of the project activity (tonnes on dry –basis)
P_y	quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *y* from plants operated at the project site
P_x	quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *x* from plants operated at the project site
x	last calendar year prior to the start of the crediting period
n	biomass residues type from one particular source for which the baseline scenario is partly B4 and partly B1/B2/B3 is the baseline scenario

Determination of $\eta_{BL,BR,p}$

This methodology covers situations where a power plant *p* includes different heat generators which can used different fuel types and which operation in parallel, supplying heat to a common heat header, as well as several heat engines with different efficiencies that that also operate in parallel and all used heat from the common heat header. Therefore, the definition of a single efficiency of electricity generation for a baseline power plant *p* is challenging, and a simplified and conservative approach (i.e. an approach that tends to overestimate $\eta_{BL,BR,p}$) is taken.

The parameter $\eta_{BL,BR,p}$ should be calculated using one of the following options for each power plant *p*:

Option 1: Default values. Use the following conservative default values:

(a) For existing plants operated at the project site prior to the implementation of the project activity: $\eta_{BL,BR,p} = 0.37$;
(b) For new plants that would be in the baseline scenario be constructed and operated at the project site: $\eta_{BL,BR,p} = 0.39$.

Option 2: Manufacturer's data. This option is only applicable to plants that were operated at the project site prior to the implementation of the project activity (and not new plants that would be constructed and operated at the project site in the baseline scenario). The overall efficiency of the plant is determined based on manufacturer's data of the efficiency of the main components under optimal operating conditions, as follows:

$$\eta_{BL,BR,p} = \eta_{BL,hg,p} \cdot \eta_{BL,mg,p} \cdot \eta_{BL,eg,p} \quad \textbf{(9)}$$

Where:

$\eta_{BL,BR,p}$	efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$\eta_{BL,hg,p}$	conservative efficiency of heat generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$\eta_{BL,mg,p}$	conservative efficiency of conversion from heat to mechanical shaft power of baseline power plant *p* (ratio)
$\eta_{BL,eg,,p}$	conservative efficiency of the electric generators of baseline power plant *p* (ratio)

For any of the parameters $\eta_{BL,hg,p}$, $\eta_{BL,mg,p}$ and $\eta_{BL,eg,,p}$, if several heat generators, heat engines and electric generators would operate in the baseline and if it can not clearly defined which configuration would prevail in the baseline, the most conservative values for efficiencies should be assumed in determining $\eta_{BL,BR,p.}$ For example, if several boilers, turbines, speed reducers and electric generators operate in the power plant *p*, it should be assumed that the most efficient boiler and the most efficient set of turbine-speed reducer-electric generator would be used the efficiency of conversion from heat to mechanical shaft power should included the speed-reducers or gear boxes required to couple the mechanical shaft power generator to the electric generator.

Option 3: Historical records. This option is only applicable to plants that were operated at the project site for at least three calendar years prior to the implantation of the project activity. The overall efficiency of a plant *p* is determined based on the historical quantity of biomass residues used in the plant and electricity generation of the plant, as follows:

$$\eta_{BL,BR,p} = MAX\left\{\frac{EG_{BR,p,x}}{\sum_n BR_{n,p,x} \cdot NCV_{n,x}}; \frac{EG_{BR,p,x-1}}{\sum_n BR_{n,p,x-1} \cdot NCV_{n,x-1}}; \frac{EG_{BR,p,x-2}}{\sum_n BR_{n,p,x-2} \cdot NCV_{n,x-2}}\right\} \quad \textbf{(10)}$$

Where:

$\eta_{BL,BR,p}$	efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$EG_{BR,p,x}$	net quantity of electricity generated from using biomass residues in power plant *p* in year *x* (MWh/ yr)
$BR_{n,p,x}$	quantity of biomass residues of category *n* used in year *x* in power plant *p* (tonnes on dry-basis)
$NCV_{n,x}$	net calorific value of biomass residue category *n* in year *x* (GJ/ tons on dry-basis)
p	power-only plant(s) operated at the project site prior to the implementation of the project activity
x	last calendar year prior to the start of the crediting period
n	biomass residue categories used for power generation at the project site in years *x*, *x-1* and *x-2*

If only biomass residues and no fossil fuels were used for electricity generation in the power plant *p* prior to the implementation of the project activity, then $EG_{BR,p,x}$, $EG_{BR,p,x-1}$ and $EG_{BR,p,x-2}$ can be obtained directly from historical electricity generation records ($EG_{BR,p,x} = EG_{p,x}$; $EG_{p,x-1}= EG_{BR,p,x-1}$; $EG_{BR,p,x-2}$, = $EG_{p,x}$-2).

If fossil fuels and biomass residues were used for electricity generation in power plant *p* prior to the implementation of the project activity, then $EG_{BR,p,x}$, $EG_{BR,p,x-1}$ and $EG_{BR,p,x-2}$ are determined as follows:

$$EG_{BR,p,x} = EG_{p,x} \cdot \frac{\sum_{n} BR_{n,p,x} \cdot NCV_{n,x}}{\sum_{n} BR_{n,p,x} \cdot NCV_{n,x} + \sum_{m} FF_{m,p,x} \cdot NCV_{m,x}} \quad \textbf{(11)}$$

Where:

$EG_{BR,p,x}$	net quantity of electricity generated from using biomass residues in power plant *p* in year *x* (MWh/ yr)
	$EG_{p,x}$ net quantity of electricity generated in power plant *p* in year *x* (MWh/ yr)
$BR_{n,p,x}$	quantity of biomass residues of category *n* used in year *x* in power plant *p* (tonnes in dry – basis)
$NCV_{n,x}$	net calorific value of biomass residue category *n* in year *x* (GJ/tons on dry-basis)
$FF_{m,p,x}$	quantity of fossil fuel type *m* fired in power plant *p* in year *x* (mass or volume unit/ yr)
$NCV_{m,x}$	net calorific value of fossil fuel type *m* in year *x* (GJ/mass or volume unit)
m	fossil fuel types used in the power plants *p* in years *x, x-1* and *x-2*
p	power plants that are operated at the site of the project activity, included in the project boundary, and (partially) fired with fossil fuels in the years *x, x-1* and *x-2*
x	last calendar year prior to the start of the crediting period

Option 4: Determination of a benchmark for the baseline efficiency. Use the average efficiency of the top 20% performing biomass residue power-only plants in the relevant region among the plants that were built in the most recent five calendar years prior to the implementation of the project activity. The region should be defined in a manner that it includes at least ten plants.

Step 1.4: Determination of $EG_{BL,FF,y}$

The minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year y ($EG_{BL,FF,y}$) should, in accordance with the baseline scenario and the historical situation before project implementation, be determined as follows:

Case 1: No use of fossil fuels in the baseline. This case applies if no fossil fuels would be used for electricity generation in the baseline scenario at the project site. In this case, $EG_{BL,FF,y} = 0$.

Case 2: No connection to the electricity grid. This case applies if all power plants included in the project boundary are off-grid power plants. In this case, the electricity generated by the project can only displace on-site electricity generation with fossil fuel and/or biomass residues ($EG_{PJ,y} = EG_{BL,FF,y} + EG_{BL,BR,y}$). Accordingly, $EG_{BL,FF,y}$ is calculated as follows:

$$EG_{BL,FF,y} = EG_{PJ,y} - EG_{BL,BR,y} \quad \textbf{(12)}$$

Where:

$EG_{BL,FF,y}$	minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{PJ,x}$	electricity generated in power plants included in the project boundary in year *y* (MWh/yr)
$EG_{BL,BR,y}$	amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh/yr)

Case 3: Grid connection and historical use of fossil fuels. This case applies if

(a) At least one power plant included in the project boundary is not an off-grid plant;

(b) Fossil fuels were used for power generation at the project site at any point in time during the most recent three calendar years prior to the implementation of the project activity; and
(c) The baseline scenario is the continued use of fossil fuels for power generation at the project site either in existing or new (co-fired) power plant(s) at the project site which is/are (co-)fired with fossil fuels
In this case, it is assumed that at least the lowest annual amount of fossil fuel use during the most recent three years would continue to be used for electricity generation in the baseline. $EG_{BL,FF,y}$ is then determined as the lowest annual amount of electricity generation with fossil fuels during the most recent three years prior to the implantation of the project activity, as follows:

$$EG_{BL,FF,y} = MIN(EG_{FF,x}; EG_{FF,x-1}; EG_{FF,x-2}) \quad \textbf{(13)}$$

Where:

$EG_{BL,FF,y}$	minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh/yr)
$EG_{FF,x}$	electricity generation with fossil fuels in power plant(s) operated in year *x* at the project site and included in the project boundary (MWh/yr)
$EG_{FF,x-1}$	electricity generation with fossil fuels in power plant(s) operated in year *x-1* at the project site and included in the project boundary (MWh/yr)
$EG_{FF,x-2}$	electricity generation with fossil fuels in power plant(s) operated in year *x-2* at the project site and included in the project boundary (MWh/yr)
x	last calendar year prior to the start of the crediting period

If only fossil fuels and no biomass residues were used for electricity generation at the project site prior to the implementation of the project activity, then $EG_{FF,x}$, $EG_{FF,x-1}$ and $EG_{FF,x-2}$, can be obtained directly from historical electricity generation records.

If fossil fuels and biomass residues were used for electricity generation at the project site prior to the implementation of the project activity, then $EG_{FF,x}$, $EG_{FF,x-1}$ and $EG_{FF,x-2}$, are determined as follows:

$$EG_{FF,x} = \sum_{m}\sum_{p}\eta_{p,FF}\cdot\frac{1}{3.6}\cdot FF_{m,p,x}\cdot NCV_{m,x} \quad \textbf{(14)}$$

Where:

$EG_{FF,x}$	electricity generation with fossil fuels in power plant(s) operated in year *x* at the project site and included in the project boundary (MWh/yr)
$\eta_{p,FF}$	efficiency of electricity generation of power plant *p* if fired only with fossil fuels and not with biomass residues
$FF_{m,p,x}$	quantity of fossil fuel type *m* fired in power plant *p* in year *x* (mass or volume unit/yr)
$NCV_{m,x}$	net calorific value of fossil fuel type *m* in year *x* (GJ/mass or volume unit)
m	fossil fuel types used in the power plant *p* in years *x, x-1* and *x-2*
p	power plants operating at the site of the project activity, included in the project boundary, and (partially) fired with fossil fuels in the years *x, x-1* and *x-2*
x	last calendar year prior to the start of the crediting period

Case 4: Grid connection, no historical use of fossil fuels, and construction of a new power plant (co-)fired with fossil fuels in the baseline scenario.
This case applies if:
(a) At least one power plant included in the project boundary is not an off-grid plant;

(b) No fossil fuels were used for power generation at the project site during the most recent three years prior to the implementation of the project activity; and
(c) The baseline scenario is the construction of new power plant(s) at the project site which is/are (co-)fired with fossil fuels.

In this case, it is difficult to establish a reasonable minimum amount of electricity hat would be generated with fossil fuel at the project site. The project activity could displace electricity in both on-site fossil fuel fired power plants or in the grid. To what extent the on-site power plant(s) is/are dispatched and to what extent grid electricity is used could depend on several parameters, including the price of electricity, the price of the fossil fuels, the on-site demand for electricity and/or the reliability of the grid. However, all these parameters may change during the crediting period.

For this reason, the following conservative approach is taken:

- If the new power plant constructed in the baseline scenario would only use fossil fuels and not co-fire any biomass residues, then $EG_{BL,FF,y} = 0$. This implies that the amount of electricity that could displace on-site electricity generation with fossil fuels is allocated to $EG_{BL,FF/grid,y}$;
- If the new power plant constructed in the baseline scenario would co-fire fossil fuels and biomass residues, then $EG_{BL,FF,y}$ should correspond to the minimum amount of fossil fuels that must be used due to technical or operational constraints to operate the power plant. This quantity should be determined based on the technical specifications obtained from manufacturers. The determination of this amount should be transparently documented and explained in the CDM-CPA-DD. Otherwise, if there are no technical constraints, if these cannot be demonstrated or if the project participant do not wish to determined a minimum amount, it should be assumed that $EG_{BL,FF,y} = 0$.

Step 1.5: Determination of $EG_{BL,grid,y}$

The minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline ($EG_{BL,grid,y}$) should, in accordance with the baseline scenario, be determined as follows:

Case 1: No connection to the electricity grid. If all power plants included in the project boundary are off-grid power plant, then the project does not displace grid electricity and $EG_{BL,grid,y} = 0$

Case 2: No electricity generation at the project site in the baseline. If no power plant would be operating at the project site in the baseline, the all electricity generated by the project displaces grid electricity, and $EG_{BL,grid,y} = EG_{PJ,y}$

Case 3: Use of only biomass residues for electricity generation at the project site in the baseline. If only biomass residue and no fossil fuels would be used for electricity generation at the project site in the baseline, then the electricity generated by the project displaces grid electricity and electricity generated with biomass residues ($EG_{PJ,y} = EG_{BL,grid,y} + EG_{BL,BR,y}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = EG_{PJ,y} - EG_{BL,BR,y} \quad \textbf{(15)}$$

Where:

$EG_{BL,grid,y}$	minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)
$EG_{PJ,y}$	electricity generated in power plants included in the project boundary in year *y* (MWh/yr)

$EG_{BL,BR,y}$ amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh/yr)

Case 4: Use of only fossil fuels for electricity generation at the project site in the baseline. If only fossil fuels and no biomass residues would be used for electricity generation at the project site in the baseline, then the electricity generated by the project can displace grid electricity and electricity generated with fossil fuels at the project site.

$EG_{BL,grid,y}$ represents the amount of electricity that could be generated in on-site power plant(s) using fossil fuels and would have to be supplied by the grid. This applies to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline ($EG_{BL,MAX,FF}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,MAX,FF} & \text{if } EG_{PJ,y} > EG_{BL,MAX,FF} \\ 0 & \text{if } EG_{PJ,y} \leq EG_{BL,MAX,FF} \end{cases} \qquad \textbf{(16)}$$

Where:

$EG_{BL,grid,y}$ minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)

$EG_{PJ,y}$ electricity generated in power plants included in the project boundary in year *y* (MWh/yr)

$EG_{BL,MAX,FF,y}$ maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline (MWh/yr)

Case 5: Use of fossil fuels and biomass residues for electricity generation at the project site in the baseline. If biomass residues and fossil fuels would be used for electricity generation at the project site in the baseline, then the electricity generated by the project can displace grid electricity, electricity generated with fossil fuels at the project site and electricity generated with biomass residues at the project site. The following scenarios can occur:

(a) **Use of all biomass residues in co-fired heat generator(s).** All biomass residues that would be used in the baseline for electricity generation would be co-fired with fossil fuels. In this case, $EG_{BL,grid,y}$ corresponds to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity generation that could be generated by co-firing fossil fuels and biomass residues in plants at the project site in the baseline ($EG_{BL,MAX,FF/BR}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,MAX,FF/BR,y} & \text{if } EG_{PJ,y} > EG_{BL,MAX,FF/BR,y} \\ 0 & \text{if } EG_{PJ,y} \leq EG_{BL,MAX,FF/BR,y} \end{cases} \qquad \textbf{(17)}$$

Where:

$EG_{BL,grid,y}$ minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)

$EG_{PJ,y}$ electricity generated in power plants included in the project boundary in year *y* (MWh/yr)

$EG_{BL,MAX,FF/BR,y}$ maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year y (MWh/yr)

(b) **Use of all biomass residues in biomass residues only heat generator(s).** All biomass residues that would be used in the baseline for electricity generation would be used in eh heat generator(s) that use only biomass residues and no fossil fuels. In this case, $EG_{BL,grid,y}$ is determined as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,MAX,FF} & \text{if } EG_{PJ,y} > \left(EG_{BL,BR,y} + EG_{BL,MAX,FF}\right) \\ 0 & \text{if } EG_{PJ,y} \le \left(EG_{BL,BR,y} + EG_{BL,MAX,FF}\right) \end{cases} \quad \textbf{(18)}$$

Where:

$EG_{BL,grid,y}$ minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)

$EG_{PJ,y}$ electricity generated in power plants included in the project boundary in year *y* (MWh/yr)

$EG_{BL,BR,y}$ amount of electricity that would be generated with biomass residues in power-only plant operated at the project site in the baseline in year *y* (MWh/yr)

$EG_{BL,MAX,FF,y}$ maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline (MWh/yr)

(c) **Use of biomass residues in both biomass residues only heat generator(s) and co-fired heat generator(s).** The biomass residues that would be sued in the baseline for electricity generation would partially be co-fired in fossil fired heat generator(s) and partially be used in heat generator(s) that use only biomass residues. This case, the project participants should document and justify in the CDM-CPA-DD what quantities of which types of biomass residues would be used in each type of heat generator, ensuring that:

$$\sum_n \sum_p BR_{BL,n,p,y} = BR_{BL,BR-only,y} + BR_{BL,co-fired,y} \quad \textbf{(19)}$$

Where:

$BR_{BL,n,p,y}$ quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry basis)

$BR_{BL,BR-only,y}$ quantity of biomass residues that would be fired in biomass-residue-only heat generators (of power-only plants) in the baseline in year *y* (tonnes on dry-basis)

$BR_{BL,co-fired,y}$ quantity of biomass residues that would be fired in co-fired heat generators (of power-only plants) in the baseline in year *y* (tonnes on dry-basis)

When $EG_{BL,grid,y}$ corresponds to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity generation that could be generated by co-firing fossil fuels and biomass residues in plants at the project site in the baseline ($EG_{BL,MAX,FF/BR,y}$) and by firing biomass residues in biomass residues only heat generators ($EG_{BL,BR-only,y}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,BR\text{-}only,y} - EG_{BL,MAX,FF/BR,y} & \text{if } EG_{PJ,y} > \left(EG_{BL,BR\text{-}only,y} + EG_{BL,MAX,FF/BR,y}\right) \\ 0 & \text{if } EG_{PJ,y} \le \left(EG_{BL,BR\text{-}only,y} + EG_{BL,MAX,FF/BR,y}\right) \end{cases} \quad \textbf{(20)}$$

Where:

$EG_{BL,grid,y}$ minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)
$EG_{PJ,y}$ electricity generated in power plants included in the project boundary in year *y* (MWh/yr)
$EG_{BL,BR-only,y}$ amount of electricity that would be generated with biomass-residue-only heat generators at the project site in the baseline in year *y* (MWh/yr)
$EG_{BL,MAX,FF/BR,y}$ maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh/yr)

The parameter $EG_{BL,BR-only,y}$ should be estimated based on the parameter $BR_{BL,BR-only,y}$ and the corresponding efficiency of power generation.

Determination of $EG_{BL,MAX,FF,y}$

$EG_{BL,MAX,FF,y}$ corresponds to the maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline. This parameter needs to be determined if fossil fuels would be used for electricity generation at the project site in the baseline. $EG_{BL,MAX,FF,y}$ is determined as follows:

$$EG_{BL,MAX,FF,y} = \sum_{n} CAP_{FF,p} \cdot 0.9 \cdot 8{,}760 \cdot hours/yr \quad \textbf{(21)}$$

Where:

$EG_{BL,MAX,FF,y}$ maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline in year *y* (MWh/yr)
$CAP_{FF,p}$ maximum electricity generation capacity of baseline power plant *p* if fired only with fossil fuels (MW)
p power-only plants that would operate at the project site in the baseline scenario

Determination of $EG_{BL,MAX,FF/BR,y}$

$EG_{BL,MAX,FF/BR,y}$ corresponds to the maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh/yr). This parameter needs to be determined if fossil fuels and biomass residues would be co-fired in heat generators of any power plant that would be used for electricity generation at the project site in the baseline. $EG_{BL,MAX,FF/BR,y}$ is determined as follows:

$$EG_{BL,MAX,FF/BR,y} = \sum_{n} CAP_{FF/BR,p,y} \cdot 0.9 \cdot 8{,}760 \cdot hours/yr \quad \textbf{(22)}$$

Where:

$EG_{BL,MAX,FF/BR,y}$ maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh/yr)
$CAP_{FF/BR,p}$ maximum electricity generation capacity of baseline power plant *p* in year *y* if fossil-fuel-only heat generators and co-fired heat generators are used (MW)
p power-only plants that would operate at the project site in the baseline scenario

$CAP_{FF/BR,p}$ should be based on the maximum heat quantity that can be generated for use in heat engines if fossil-fuel-only heat generators and co-fired heat generators are used (but no biomass-residue-only heat generators). Note that $CAP_{FF/BR,p}$ depends on the amount of biomass residues co-fired in heat generators of the power plant. it is therefore determined based on the monitored amounts of biomass resides that would be co-fired in heat generators in year *y* ($BR_{BL,co-fired,y}$). project participant will document transparently and justify in the CDM-CPA-DD how they determine $CAP_{FF/BR,p}$ as a function of $BR_{BL,co-fired,y}$ for each calendar year.

Alternatively, as a conservative approach, the following can be assumed: $EG_{BL,MAX,FF/BR,y} = EG_{BL,MAX,FF}$

Step 1.6: Determination of $EG_{BL,FF/grid,y}$

$EG_{BL,FF/grid,y}$ represents the amount of electricity that could be generated in the baseline in the grid or at the project site using fossil fuels. $EG_{BL,FF/grid,y}$ corresponds to the remainder of electricity generation, i.e. the amount that exceeds the minimum amount of electricity that would be generated by power plants in the electricity grid ($EG_{BL,grid,y}$), the minimum amount of electricity that could be generated with fossil fuels at the project site ($EG_{BL,FF,y}$), and the amount of electricity that would be generated with biomass residues at the project site ($EG_{BL,BR,y}$). Accordingly, $EG_{BL,FF/grid,y}$ is calculated as follows:

$$EG_{BL,FF/grid,y} = EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,FF,y} - EG_{BL,grid,y} \quad \textbf{(23)}$$

Where:

$EG_{BL,FF/grid,y}$	amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year *y* (MWh)
$EG_{PJ,y}$	electricity generated in power plants included in the project boundary in year *y* (MWh)
$EG_{BL,BR,y}$	amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$EG_{BL,FFy}$	minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{BL,grid,y}$	minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year y (MWh)

Step 1.7: Determination of $EF_{BL,FF,y}$

$EF_{BL,FF,y}$ should be determined using Option A or Option B below. If fossil fuel power plants were operated at the project site prior to the implementation of the project activity, either option A or option B can be used to determine $EF_{BL,FF,y}$. For new power plants that would be constructed at the project site in the baseline scenario, Option B is used.

Option A: Determine $EF_{BL,FF,y}$ as per the procedure described under "Scenario B: Electricity consumption from an off-grid captive power plant" in the latest approved version of the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" version 01 (versions which may be updated, as necessary), using data from three calendar years prior to the implantation of the project activity.

Option B: Determine a default emission factor for $EF_{BL,FF,y}$ based on a default efficiency of the power plant that would be operated at the project site in the baseline and a default CO_2 emission factor for the fossil fuel types that would be used, as follows:

$$EF_{BL,FF,y} = 3.6 \cdot \frac{EF_{BL,CO2,FF}}{\eta_{BL,FF}} \quad \textbf{(24)}$$

Where:

$EF_{BL,FF,y}$	CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline year y (tCO_2/ MWh)

$EF_{BL,CO2,FF}$	CO_2 emission factor of the fossil fuel type that would be used for power generation at the project site in the baseline (tCO_2/ GJ) [21]
$\eta_{BL,FF}$	efficiency of the fossil fuel power plant(s) at the project site in the baseline

Step 1.8: Determination of $EF_{grid,CM,y}$

$EF_{grid,CM,y}$ should be determined as the combined margin CO_2 emission factor for grid connected power generation in year y, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system" version 03.0.0 (versions which may be updated, as necessary).

Step 2: Determination of baseline emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$)

The calculation of baseline emissions dues to uncontrolled burning or decay of biomass residues is optional and project participant can decide whether to include these emission sources or not. If project participant wish to include these emission sources, the procedure below should be followed, and emissions from combustion of biomass residues under the project activity should be also be determined. Otherwise, this section does not need to be applied and project emissions do no need to include emissions from the combustion of biomass residues under the project activity.

Baseline emissions due to uncontrolled burning or decay of biomass residues are only determined for those categories of biomass residues for which B1, B2 or B3 has been identified as the most plausible baseline scenario. The guidance for the determination of $BR_{BL,n,p,y}$ should be considered in determining the quantities of biomass residues for each biomass residue category.

The emissions are determined separately for biomass residues categories for which scenarios B1 and B3 (aerobic decay or uncontrolled burning) apply, and for biomass residues categories for which scenario B2 (anaerobic decay) apply:

$$BE_{BR,y} = BE_{BR,B1/B3,y} + BE_{BR,B2,y} \quad \textbf{(25)}$$

Where:

$BE_{BR,y}$	baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2)
$BE_{BR,B1/B3,y}$	baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (tCO_2)
$BE_{BR,B2,y}$	baseline emissions due to anaerobic decay of biomass residues in year *y* (tCO_2)

Step 2.1: Determination of $BE_{BR,B1/B3,y}$

For the biomass residues categories for which the most likely baseline scenario is either that the biomass residues would be dumped or left to decay under mainly aerobic conditions (B1), or burnt in an uncontrolled manger without utilizing them for energy purposes (B3), baseline emissions are calculated assuming, for both scenarios (aerobic decay and uncontrolled burning), that the biomass residues would be burnt in an uncontrolled manner.

Baseline emissions are calculated by multiplying the quantity of biomass residues with the net calorific value and an appropriate emission factor, as follows:

[21] 2006 IPCC Guidelines for National Gas Inventories: Reference Manual; Volume 2, Chapter 1, Table 1-4

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot NCV_{n,y} \cdot EF_{BR,n,y} \quad \textbf{(26)}$$

Where:

$BE_{BR,B1/B3,y}$	baseline emissions due to uncontrolled burning or anaerobic decay of biomass residues in year *y* (tCO_2)
GWP_{CH4}	global warming potential of methane valid for the commitment period (tCO_2/ tCH_4)
$BR_{n,B1/B3,y}$	amount of biomass residues category *n* used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario (tonnes on dry-basis)
$NCV_{n,y}$	net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)
$EF_{BR,n,y}$	CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y* (tCH_4/GJ)
n	categories of biomass residues

To determine the CH_4 emission factor, project participant may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 tCH_4 per ton of biomass as default value for the product of NCV_k and $EF_{burning,CH4,k,y}$[22]

The uncertainty of the CH_4 emission factor ($EF_{BR,n,y}$) is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. The appropriate conservativeness factor from Table 2 below shall be chosen and multiplied with the estimate for the CH_4 emission factor. For example, if the default CH_4 emission of 0.0027 tCH_4/t biomass is used, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73. Thus, in this case an emission factor of 0.001971 tCH4/t biomass should be used.

Table 2: Conservativeness factors, as per Table 3 of ACM0018 ver. 02.0.0

Estimated uncertainty range (%)	**Assigned uncertainty band (%)**	**Conservativeness factor where lower values are more conservative**
Less than or equal to 10	7	0.98
Greater than 10 and less than or equal to 30	20	0.94
Greater than 30 and less than or equal to 50	40	0.89
Greater than 50 and less than or equal to 100	75	0.82
Greater than 100	150	0.73

Step 2.2: Determination of $BE_{BR,B2,y}$

For the biomass residues categories, for which the most likely baseline scenario is that the biomass residues would decay under clearly anaerobic conditions (case B2), project participants shall calculate baseline emissions using the latest approved version of the tool "Emissions from solid waste disposal sites" version 06.0.1 (versions which may be updated, as necessary). The variable $BE_{CH4,SWDS,y}$ calculated

[22] 2006 IPCC Guidelines, Volume 4, table 2.5, default value for agricultural residues

by the tool corresponds to $BE_{BR,B2,y}$ in this methodology. The project participant shall use as waste quantities prevented from disposal ($W_{j,x}$) in the tool, those quantities of biomass residues ($BR_{n,B2,y}$) for which B2 has been identified as the most plausible baseline scenario.

The determination of $BR_{n,B2,y}$ shall be based on the monitored amounts of biomass residues used in power plant included in the project boundary. Where all biomass residues with the baseline scenario B2 come from one particular source, the monitored quantities of biomass residues used from the source in the project plant ($BR_{PJ,n,y}$) can be directly used. Where only parts of the biomass residues form one source would be dumped under clearly anaerobic conditions (B2), an allocation should be made. The allocation should be in a conservative manner and consistent with the guidance provided before for $BR_{BL,n,p,y}$. The project participants would specify and justify in the CDM-CPA-DD in a transparent manner how the relevant allocations should be made and how $BR_{n,B2,y}$ should be determined for the relevant biomass residue category *n* based on the monitored quantities. The approaches used should be consistent with the identified baseline scenario and reflect the particular situation of the underlying project activity.

Project Emissions

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} \quad \textbf{(27)}$$

Where:

PE_y project emissions during the year *y* (tCO_2e)

$PE_{FF,y}$ emissions during the year *y* due to fossil fuel consumption (tCO_2)

$PE_{EL,y}$ emissions during the year *y* due to electricity use off-site for the processing of biomass residues (tCO_2)

$PE_{TR,y}$ emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2)

$PE_{BR,y}$ emissions from the combustion of biomass residues during the year *y* (tCO_2e)

$PE_{ww,y}$ emissions from wastewater generated from the treatment of biomass residues in year *y* (tCO_2e)

Determination of $PE_{ff,y}$

The following emission sources should be included in determining $PE_{FF,y}$:

- Emissions from on-site fossil fuel consumption for the generation of electric power. This includes all fossil fuels used at the project site in heat generator (e.g. boilers) for the generation of electric power; and
- Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power. This includes fossil fuels required for the operation of auxiliary equipment related to the power plants (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.) which are not accounted in the first bullet, and
- Fossil fuels required for the operation of equipment related to the on-site or off-site preparation, storage, processing and transportation of fuels and biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, pelletization, shredding, briquetting processes, etc.).
- If any fossilized or non-biodegradable materials are used in the processing of biomass residues and incorporated in the processes biomass residues (e.g. binders) then emissions arising from those materials should be accounted for when the processes biomass residues are combusted. For that purpose those materials should be deemed as fossil fuels. If net calorific values, carbon content and/or emission factors of those material are available they could be used, otherwise the

net calorific values, carbon content and/or emission factors of the most carbon intensive fossil fuel available in the county should be used.

The latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 02 (versions which may be updated, as necessary) shall be used to calculate $PE_{FF,y}$. All combustion processes *j* as described in the two bullets above will be included.

Determination of $PE_{EL,y}$

Emission should be included that result from the generation of electric power required or the operation of equipment related to the off-site preparation processing, storage and transportation of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, pelletization, shredding, briquetting processes, etc.). The latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" version 01 (versions which may be updated, as necessary) shall be used to calculate the $PE_{EL,y}$. Note that the electric power used on-site for the purposes described above area already accounted as part of $EG_{PJ,aux,y}$. $PE_{EL,y}$ should account thus only for the off-site use of electricity.

Determination of $PE_{TR,y}$

In cases where the biomass residues are not generated directly at the project site, project participant shall determined CO_2 emissions resulting from transportation of the biomass residues to the project plant using the latest version of the tool "Project and leakage emissions from transportation of freight". $PE_{TR,m}$ in the tool corresponds to the parameter $PE_{TR,y}$ in this methodology and the monitoring period *m* is one year.

Determination of $PE_{BR,y}$

If project proponents chose to include emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$) in the calculation of baseline emission, then emissions from the combustion of biomass residues have also to be included in the project scenario. Otherwise, this emission source need not be included. Corresponding emissions are calculated as follows:

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_{n} BR_{PJ,n,y} \cdot NCV_{n,y} \qquad \textbf{(28)}$$

Where:

PE_{BRy}	
GWP_{CH4}	global warming potential for methane valid for the relevant commitment period (tCO_2/ tCH_4)
$EF_{CH4,BR}$	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)
$BR_{PJ,n,y}$	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	net calorific value of the biomass residues category *n* in year *y* (GJ/ tonnes on dry-basis)

To determine the CH_4 emission factor, project participant may conduct measurements at the plant site or use IPCC default values, as provided in Table 3 below. The uncertainty of the CH_4 emission factor is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. Project participant will select the appropriate conservativeness factor from Table 4 below and will multiply the estimate for the CH4 emission factor with the conservativeness factor.

Table 3: Default CH4 emission factors for combustion of biomass residues[23], as per Table 4 of ACM0018 ver. 02.0.0

	Default emission factor (kg CH_4/TJ)	Assumed uncertainty
Wood waste	30	300%
Sulphite lyes (Black Liquor)	3	300%
Other solid biomass residues	30	300%
Liquid biomass residues	3	300%

Table 4: Conservativeness factors, as per Table 5 of ACM0018 ver. 02.0.0

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factor where higher values are more conservative
Less than or equal to 10	7	1.02
Greater than 10 and less than or equal to 30	20	1.06
Greater than 30 and less than or equal to 50	40	1.12
Greater than 50 and less than or equal to 100	75	1.21
Greater than 100	150	1.37

Determination of $PE_{WW,CH4,y}$

This emission source is estimated in cases where wastewater originating from the treatment of the biomass is (partly) treated under anaerobic conditions and methane from the wastewater is not captured and flared or combusted. Project emissions from wastewater are estimated as follows:

$$PE_{WW,CH4,y} = GWP_{CH4} \cdot V_{WW,y} \cdot COD_{WW,y} \cdot B_{o,WW} \cdot MCF_{WW} \quad \textbf{(29)}$$

Where:

$PE_{ww,CH4,y}$	CH_4 emission from wastewater generated from the treatment of biomass residues in year *y* (tCO_2)
GWP_{CH4}	global warming potential for methane valid for the relevant commitment period (tCO_2/ tCH_4)
$V_{ww,y}$	quantity of waste water generated in year *y* (m^3)
$COD_{ww,y}$	average chemical oxygen demand of the wastewater in year *y* (tCOD/ m^3)
$B_{o,ww}$	methane generation potential of the wastewater (tCH_4/ tCOD)[24]
MCF_{ww}	methane correction factor of the wastewater (ratio)[25]

Leakage Emission

The main potential source of leakage for this project activity is an increase in emissions from fossil fuels combustion or other sources due to diversion of biomass residues from other uses to the project plant as a

[23] Values are based on the 2006 IPCC Guidelines, Volume 2, Chapter 2, Tables 2.2 to 2.6

[24] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5 Chapter 6 Page 6.12Table 6.2

[25] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5 Chapter 6 Page 6.13Table 6.3

result of the project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant since this methodology is limited to biomass residues, as defined in the applicability conditions above. The baseline scenarios for biomass residues for which this potential leakage is relevant are B5, B6, B7 and B8.

The actual leakage emissions in each of these cases may differ significantly and depend on the specific situation of each project activity. For that reason, a simplified approach is use in this methodology: it is assumed that an equivalent amount of fossil fuels, on energy basis, would be used if biomass residues are diverted from other uses, no matter what the use of biomass residues would be in the baseline scenario.

Therefore, for the categories of biomass residues whose baseline scenario has been identified as B5, B6, B7 or B8, project participants shall calculate leakage emission as follows:

$$LE_y = EF_{CO2,LE} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{n,y} \quad \textbf{(30)}$$

Where:

LE_y	leakage emissions in year *y* (tCO_2/yr)
$EF_{CO2,LE}$	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ)
$BR_{PJ,n,y}$	quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	net calorific value of the biomass residues category *n* in year *y* (GJ/ton of dry matter)
n	categories of biomass residues for which B5, B6, B7 or B8 has been identified as the baseline scenario

The determination of $BR_{PJ,n,y}$ shall be based on the monitored amounts of biomass residues used in power plants included in the project boundary.

In the case that negative overall emission reductions arise in a year through application of the leakage emission, CERS are not issue to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. For example, if negative emission reductions of 30 tCO_2e occur in the year t and positive emission reductions of 100 tCO_2e occur in the year t+1, only 70 CERs are issued for the year t+1.

Changes required for methodology implementation in 2nd and 3rd crediting periods

At the start of the second and third crediting period for a project activity, the continued validity of the baseline shall be assessed by applying the latest version of the tool "Assessment of the validity of the original/ current baseline and update of the baseline at the renewal of the crediting period".

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential for methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	21

Justification of the choice of data or description of measurement methods and procedures actually applied :	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions
Any comment:	-

Data / Parameter:	**Amount of fuel used in the heat generation equipment, if any**
Data unit:	GJ
Description:	If any heat which is used for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) is generated during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the amount of fuel used in the heat generation equipment should be monitored and clearly differentiated from any fuel used in the project activity. The following conditions should be checked using this data: • The implantation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operated in the same manner in the absence of the project activity; and • The heat generation equipment does not influence directly or indirectly the operation of the project plant, e.g. no fuels are diverted from the heat generation equipment to the project plant
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use weight or volume meters. The quantity shall be cross-checked with the quantity of electricity generated and any fuel purchase receipts (if applicable)
Any comment:	This parameter is related to an applicability condition

Data / Parameter:	**Biomass residues categories and quantities user for the selection of the baseline scenario selection and assessment of additionality**
Data unit:	• Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); • Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); • Fate in the absence of the project activity (Scenarios B); • Use in the project scenario (Scenarios P); • Quantity (tonnes on dry-basis)
Description:	Explain and document transparently in the CDM-PDD, which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. For the selection of the baseline scenario and demonstration of additionality, at the validation stage, an *ex ante* estimation of these quantities should be provided

Source of data used:	On-site measurement of biomass residues categories and quantities
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	This parameter is related to the procedure for selection of the baseline scenario selection and assessment of additionality

Data / Parameter:	$\mathbf{BR}_{n,power\text{-}only,x}$
Data unit:	Tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in year *x* in power-only plants which were used at the project site prior to the implementation of the project activity
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generators and any fuel purchase receipts (if available).
Any comment:	-

Data / Parameter:	$\mathbf{BR}_{n,p,x}$
Data unit:	Tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in year *x* in power plant *p*
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available)
Any comment:	-

Data / Parameter:	$\mathbf{FF}_{m,p,x}$
Data unit:	Mass or volume unit/yr
Description:	Quantity of fossil fuel type *m* fired in power plant *p* in year *x*
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available)

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**P_x**
Data unit:	Use suitable unit, as appropriate
Description:	Quantity of the main produce of the production processes (e.g. sugar cane, rice, etc.) produced in year *x* from plants operated at the project site
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	**$EG_{p,x}$**
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in power plant *p* in year *x*
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use calibrated electricity meters
Any comment:	-

Data / Parameter:	**$EG_{FF,x}$, $EG_{FF,x-1}$, $EG_{FF,x-2}$**
Data unit:	MWh/yr
Description:	Electricity generation with fossil fuels in power plant(s) included in the project boundary, operated respectively in years *x*, *x-1*, *x-2* at the project site
Source of data used:	On-site measurements
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use calibrated electricity meters
Any comment:	-

Data / Parameter:	**$NCV_{n,x}$**
Data unit:	GJ/tons on dry-basis
Description:	Net calorific value of biomass residue category *n* in year *x*
Source of data used:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Any comment:	-

Data / Parameter:	**$NCV_{m,x}$**
Data unit:	GJ/ mass or volume unit
Description:	Net calorific value of fossil fuel type *m* in year *x*
Source of data used:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Any comment:	-

Data / Parameter:	**$EF_{BL,CO2,FF,d}$**
Data unit:	tCO_2/GJ
Description:	CO_2 commission factor of the fossil fuel type that would be used for power generation at the project site in the baseline
Source of data used:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the value in a conservative manner and justify the choice
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods	Measurements shall be carried out at reputed laboratories and according to relevant international standards

and procedures actually applied :	
Any comment:	In case of plants existing before project implementation, the lowest CO_2 emission factor should be used in case of multi fuel plant

Data / Parameter:	$\eta_{BL,BR,p}$
Data unit:	Ratio
Description:	Efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuel
Source of data used:	Survey conducted by the project participants or third parties
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use the average efficiency of the top 20% performing biomass residue power-only plants in the relevant region among the plants that were built in the most recent five calendar years prior to the implementation of the project activity. The region should be defined in a manger that it includes at least ten plants
Any comment:	-

Data / Parameter:	$\eta_{BL,hg,p}$, $\eta_{BL,mg,p}$, $\eta_{BL,eg,p}$
Data unit:	Ratio
Description:	Respectively: conservative efficiency of heat generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels; conservative efficiency of conversion from heat to mechanical shaft power of baseline power plant *p*; and conservative efficiency of the electric generators of baseline power plant *p*
Source of data used:	Manufacturer’s data
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	If several heat generators, heat engines and electric generators would operate in the baseline and if it can not be clearly defined which configuration would prevail in the baseline, the most conservative values for efficiencies should be assumed. For example, if several boilers, turbines, speed reducers and electric generators operate in the power plant p, it should be assumed that the most efficient boiler and the most efficient set of turbine-speed reducer-electric generator would be used. The efficiency of conversion from heat to mechanical shaft power should include the speed-reducers or gear boxes required to couple the mechanical shaft power generator to the electric generator

Data / Parameter:	$\eta_{p,FF}$
Data unit:	Ratio
Description:	Efficiency of electricity generation of power plant p if fired only with fossil fuels and not with biomass residues

Source of data used:	Either use the higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency; OR assume an efficiency of 100% as a conservative default value
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	If measurements are conducted, use recognized standards for the measurement of the heat generator efficiency, such as the "*British Standard Methods for Assessing the thermal performance of boilers for steam, hot water and high temperature heat transfer fluids*" (BS845). Where possible, use preferably the direct method (dividing the net heat generation by the energy content of the fuels fired during a representative time period), as it is better able to reflect average efficiencies during a representative time period compared to the indirect method (determination of fuel supply or heat generation and estimation of the losses). Document measurement procedures and result and manufacturer's information transparently in the CDM-CPA-DD
Any comment:	-

Data / Parameter:	$\eta_{BL,FF}$
Data unit:	Ratio
Description:	Efficiency of the fossil fuel power plant(s) at the project site in the baseline
Source of data used:	Either use the higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency; OR use the default values as provided in Annex 1 of the "Tool to calculate the emission factor for an electricity system" version 03.0.0 (versions which may be updated, as necessary); OR assume an efficiency of 100%
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	If measurements are conducted, use recognized standards for the measurement of the heat generator efficiency, such as the "*British Standard Methods for Assessing the thermal performance of boilers for steam, hot water and high temperature heat transfer fluids*" (BS845). Where possible, use preferably the direct method (dividing the net heat generation by the energy content of the fuels fired during a representative time period), as it is better able to reflect average efficiencies during a representative time period compared to the indirect method (determination of fuel supply or heat generation and estimation of the losses). Document measurement procedures and result and manufacturer's information transparently in the CDM-CPA-DD
Any comment:	-

Data / Parameter:	$CAP_{FF,p}$
Data unit:	MW
Description:	Maximum electricity generation capacity of baseline power plant p if fired only with fossil fuels
Source of data used:	On-site measurements or manufacturer's data
Value applied:	To be determined individually in each CPA
Justification of the choice of data or description of measurement methods and procedures	-

actually applied :	
Any comment:	-

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each CPA:

Data / Parameter:	**P_y**
Data unit:	Use suitable units, as appropriate
Description:	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *y* from plants operated at the project site
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight or volume meters
Monitoring frequency:	Data aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	The quantity shall be cross-checked with the quantity of product generated and any stock changes
Any comment:	-

Data / Parameter:	**Amount of fuel used in the heat generation equipment, if any**
Data unit:	GJ
Description:	If any heat which is used for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) is generated during the crediting period or was generate prior to the implantation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the amount of fuel used in the heat generation equipment should be monitored and clearly differentiated from any fuel used in the project activity. The following conditions should be checked using this data: • The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; and • The heat generation equipment does not influence directly or indirectly the operation of the project plant, e.g. no fuels are diverted from the heat generation equipment to the project plant
Source of data to be used:	On-site measurements
Value of data applied	To be determined individually in each CPA

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Use weight or volume meters. The quantity shall be cross-checked with the quantity of electricity generated and any fuel purchase receipts (if available)
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	The quantity shall be cross-checked with the quantity of electricity generated and any fuel purchase receipts (if available)
Any comment:	This parameter is related to an applicability condition

Data / Parameter:	**Biomass residues categories and quantities used in the project activity**
Data unit:	• Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); • Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); • Fate in the absence of the project activity (Scenarios B); • Use in the project scenario (Scenarios P); • Quantity (tonnes on dry-basis)
Description:	Explain and document transparently in the CDM-PDD, which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. These quantities should be updated every year of the crediting period as part of the baseline and monitoring methodology as to reflect the actual use of biomass resides in the project scenario. These updated values should be used for emissions reductions calculations. Along the crediting period, new categories of biomass residues (i.e. new types, new sources, with different fate) can be used in the project activity. If those new categories are of the type B1, B2 or B3, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in the guidance provided in the procedure for the selection of the baseline scenario and demonstration of additionality
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to	Cross-check the measurements with an annual energy balance that is based on

be applied:	purchased quantities and stock changes
Any comment:	-

Data / Parameter:	**$BR_{PJ,n,y}$**
Data unit:	Tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	The biomass residues quantities used should be monitored separately for (a) each type of biomass residue (e.g.) and each source(e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.)

Data / Parameter:	**$BR_{n,B1/B3,y}$**
Data unit:	Tonnes on dry-bases
Description:	Amount of biomass residues category *n* used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight meters. Adjust for the moisture content in order to determined the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	-

Data / Parameter:	**For biomass residues categories for which scenarios B1, B2 or B3 is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario**
Data unit:	Tones
Description:	• Quantity of available biomass residues of type *n* in the region • Quantity of biomass residues of type *n* that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region • Availability of a surplus of biomass residues type *n* (which can not be sold or utilised) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region
Source of data to be used:	Surveys or statistics
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Surveys or statistics
Monitoring frequency:	At the validation stage for biomass residues categories identified *ex-ante*, and always that new biomass residues categories are included during the crediting period
QA/QC procedures to be applied:	Value to be surveyed annually
Any comment:	-

Data / Parameter:	$\mathbf{BR_{BL,BR-pnly,y}}$
Data unit:	Tonnes on dry-basis
Description:	Quantity of biomass residues that would be fired in biomass-residue-only heat generators (of power-only plants) in the baseline in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchased receipts (if available)
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-

Any comment:	-

Data / Parameter:	$\mathbf{BR_{BL,co\text{-}fired,y}}$
Data unit:	Tonnes on dry-basis
Description:	Quantity of biomass residues that would be fired in co-fired heat generators (of power-only plants) in the baseline in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchased receipts (if available)
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$\mathbf{EG_{PJ,gross,y}}$
Data unit:	MWh
Description:	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generated divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	-

Data / Parameter:	$\mathbf{EG_{PJ,aux,y}}$
Data unit:	MWh

Description:	Total auxiliary electricity consumption required for the operation of the power plants at the project site
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generated divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	$EG_{PJ,aux,y}$ shall include all electricity required for the operation of equipment related to the preparation, storage and transport of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.)

Data / Parameter:	**$NCV_{n,y}$**
Data unit:	GJ/ tonnes on dry-basis
Description:	Net calorific value of biomass residues of category *n* in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV on dry-basis
Monitoring frequency:	At least every six months, taking at least three samples for each measurement
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement result with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass
Any comment:	-

Data / Parameter:	**$EF_{BR,n,y}$**
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y*
Source of data to be used:	Conduct measurements of use reference default values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	To determine the CH4 emission factor, project participant may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 tCH_4 per ton of biomass as default value for the product of NCV_k and $EF_{burning,CH4,k,y}$
Monitoring frequency:	Value to be updated annually
QA/QC procedures to be applied:	Value to be surveyed annually
Any comment:	-

Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% water content
Description:	Moisture content of each biomass residues type *k*
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Laboratory sampling method for moisture content – biomass residue is oven dried
Monitoring frequency:	The moisture content should be monitored for each batch of biomass of homogeneous quality. The weighted average should be calculated for each monitoring period and used in the calculations
QA/QC procedures to be applied:	Average value shall be cross checked with industrial standard on the moisture content of the each biomass residue type
Any comment:	In case of dry biomass, monitoring of this parameter is not necessary

Data / Parameter:	**$CAP_{FF/BR,p,y}$**
Data unit:	MW
Description:	Maximum electricity generation capacity of baseline power plant *p* in year *y* if fossil-fuel-only heat generators and co-fired heat generators are used
Source of data to be used:	On-site measurements

Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	$CAP_{FF/BR,p,y}$ should be based on the maximum heat quantity that can be generated for use in heat engines if fossil-fuel-only heat generators and co-fired heat generators are sued (but no biomass-residue-only heat generators). Note that $CAP_{FF/BR,p,y}$ depends on the amount of biomass residues co-fired in heat generators of the power plant it is therefore determined based on the monitored amounts of biomass residues that would be co-fired in heat generators in year y ($BR_{BL,co\text{-}fired,y}$). Project participants should document transparently and justify in the CDM-CPA-DD how they determine $CAP_{FF/BR,p,y}$ as a function of $BR_{BL,co\text{-}fired,y}$ for each calendar year
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	Ensure metering equipment is operated and maintained as per manufacturer's specification
Any comment:	-

Data / Parameter:	**$EF_{CH4,BR}$**
Data unit:	tCH_4/ GJ
Description:	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data to be used:	On-site measurements or default values, as provided in Table 4
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	The CH_4 emission factor may be determined based on a stack gas analysis using calibrated analyzers
Monitoring frequency:	At least quarterly, taking at least three samples per measurement
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement result with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements
Any comment:	Monitoring of this parameter for project emissions is only required if CH_4 emission from biomass combustion are included in the project boundary. Note that a conservative factor shall be applied, as specified in the baseline methodology

Data / Parameter:	**$EF_{CO2,LE}$**
Data unit:	tCO_2/ GJ
Description:	CO_2 emission factor of the most carbon intensive fuel used in the country
Source of data to be	Identify the most carbon intensive fuel type from the national communication,

used:	other literature sources (e.g. IEA). Possibly consult with the national agency responsible for the national communication/ GHG inventory. If available, use national default values for the CO_2 emission factor. Otherwise, IPCC default values may be used
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Survey
Monitoring frequency:	Annually
QA/QC procedures to be applied:	Survey
Any comment:	-

Data / Parameter:	**$V_{ww,y}$**
Data unit:	m^3
Description:	Quantity of waste water generated in year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	The effluent inflow will be monitored continuously using a flow meter
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures to be applied:	The data will be measured directly, and data recorded an stored. Flow meter shall be maintained as per manufacturer's specifications
Any comment:	-

Data / Parameter:	**$COD_{ww,y}$**
Data unit:	$tCOD/m^3$
Description:	Average chemical oxygen demand of the waste water in year *y*
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA

Description of measurement methods and procedures to be applied:	Analytical technique for COD measurement
Monitoring frequency:	At least once a month
QA/QC procedures to be applied:	Samples provided to certified laboratory for analysis
Any comment:	-

Data / Parameter:	$\mathbf{B_{o,ww}}$
Data unit:	tCH_4/ tCOD
Description:	Methane generation potential of the waste water
Source of data to be used:	On-site measurement or reference default values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Value to be checked annually
Monitoring frequency:	Annually
QA/QC procedures to be applied:	Value to be check annually and counter-check with
Any comment:	-

Data / Parameter:	$\mathbf{MCF_{ww}}$
Data unit:	Ratio
Description:	Methane correction factor for the waste water
Source of data to be used:	On-site measurement or reference default values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Survey
Monitoring frequency:	Annually
QA/QC procedures to be applied:	Survey
Any comment:	-

Data / Parameter:	**$FC_{i,j,y}$**
Data unit:	Mass or volume unit per year (e.g. ton/yr or m3/yr)
Description:	Quantity of fuel type i combusted in process j during the year y
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Continuously
QA/QC procedures to be applied:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

Data / Parameter:	**$W_{C,i,y}$**
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type i in year y
Source of data to be used:	The following data sources may be used if the relevant conditions apply:
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel standards

Date source	**Conditions for using the date source**
a) Values provided by the fuel supplier in invoices	This is the preferred source
b) Measurements by the project participants	If a) is not available

Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures to be applied:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used

Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type i in year y
Source of data to be used:	The following data sources may be used if the relevant conditions apply:
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures to be applied:	-
Any comment:	Applicable where Option A is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$.

Date source	Conditions for using the data sourc
a) Values provided by the fuel supplier in invoices	This is the preferred source
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	Weighted average CO2 emission factor of fuel type i in year y
Source of data to be used:	The following data sources may be used if the relevant conditions apply:

Date source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is the preferred source

<table>
<tr><td></td><td><table>
<tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available
These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions in section B.5</td><td>To be determined individually in each CPA</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency:</td><td>For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into accou</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>-</td></tr>
<tr><td>Any comment:</td><td>Applicable where option B is used.
For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
</table>

Data / Parameter:	f_y
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data to be used:	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Value of data applied for the purpose of	To be determined individually in each CPA

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	-
Monitoring frequency:	For application A: Once for the crediting period ($f_y = f$) For application B: Annually
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**W_x or W_i**
Data unit:	t
Description:	Total amount of waste disposed in a SWDS in year *x* or month *i*
Source of data to be used:	Measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Measure on wet basis
Monitoring frequency:	Continuously, aggregated at least annually for year *x* or monthly for month *i*
QA/QC procedures to be applied:	-
Any comment:	For application B

Data / Parameter:	**$p_{n,j,x}$ or $p_{n,j,i}$**
Data unit:	-
Description:	Weight fraction of the waste type j in the sample n collected during the year *x* or month *i*
Source of data to be used:	Sample measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Sample the waste composition, using the waste categories j, as provided in the table for DOC_j and k_j, and weigh each waste fraction (measure on wet basis)
Monitoring frequency:	Minimum of three samples every three months

QA/QC procedures to be applied:	-
Any comment:	This parameter only needs to be monitored for Application B and if the waste includes more than one waste type j. Sampling is not required if the waste comprises only one waste type

Data / Parameter:	$\mathbf{z_x}$
Data unit:	-
Description:	Number of samples collected during the year *x*
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Minimum of three samples every three months
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures to be applied:	-
Any comment:	This parameter only needs to be monitored for Application B and if the waste includes more than one waste category *j*

Data / Parameter:	$\mathbf{d_y}$
Data unit:	m
Description:	Depth of the SWDS
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Monitoring well that is also used to measure the height of the water table ($h_{w,y}$)
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model
QA/QC procedures to be applied:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then this parameter is

	used to determine the MCF

Data / Parameter:	**$h_{w,y}$**
Data unit:	m
Description:	Height of the water table in the SWDS
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Monitoring well
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model
QA/QC procedures to be applied:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then this parameter is used to determine the MCF

Data / Parameter:	**a, b, c, d, e, g**
Data unit:	%
Description:	Effect of the uncertainty of different parameters
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined individually in each CPA
Description of measurement methods and procedures to be applied:	Using the instructions in Table 3 (of the tool) above.
Monitoring frequency:	Annually if the conditions described in the “Instructions for selecting the factor” in Table 3(of the tool) have changed (e.g. a change in how the weight of the waste is measured). Once for the crediting period, if these conditions do not change.
QA/QC procedures to be applied:	-
Any comment:	Used in Option 2 for determining the model correction factor

Data / Parameter:	$D_{f,m}$
Data unit:	Kilometre
Description:	Return trip distance between the origin and destination of freight transportation activity *f* in monitoring period *m*
Source of data to be used:	Records of vehicle operator or records by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer CER tabulation file
Description of measurement methods and procedures to be applied:	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources
Monitoring frequency:	To be updated whenever the rad distance changes
QA/QC procedures to be applied:	-
Any comment:	Applicable for option B

Data / Parameter:	$FR_{f,m}$
Data unit:	Tonnes
Description:	Total mass of freight transported in freight transportation activity *f* in monitoring period *m*
Source of data to be used:	Records by project participants or records by truck operators
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer CER tabulation file
Description of measurement methods and procedures to be applied:	Measurement based on weigh bridge receipt for each load of freight received
Monitoring frequency:	Continuously
QA/QC procedures to be applied:	-
Any comment:	Applicable for option B

E.7.2. Description of the monitoring plan for a CPA:

Monitoring plan
The purpose of this monitoring plan is to provide a standard monitoring procedure for the CPA under the proposed PoA. The monitoring plan is an integral part of this design document and is utilized to facilitate accurate and consistent monitoring of the project's Certified Emissions Reductions (CER).

The monitoring plan is made in accordance with the relevant rules and regulations of CDM and the CME will manage the monitoring programme, ensuring that each CPA adheres to the data collection, processing and reporting requirements of the monitoring plan. The monitoring plan will be adhered to for the duration of the project activity, to monitor the progress of the project activity, and at the same time prepare for the periodic verification process. The monitoring plan will facilitate the following:

- Establish the monitoring system - baseline operation and monitoring manual
- Guide for implementation of the monitoring system
- Guide for implementation of the necessary management, operation and maintenance operations
- Guide for meeting CDM requirements for the verification and certification process

Monitoring obligations
To facilitate CER determination, each CPA must fulfil the requisite operational and data collection obligations. Meeting the operational and data collection obligation will ensure that monitoring was carried out as specified in the baseline operation and monitoring manual, and that CERs are tabulated in a transparent manner.

The CME will maintain all monitoring reports for all CPAs under the PoA in accordance with the record keeping system and make available all monitoring reports required by the Designated Operating Entity (DOE) for verification purposes.

Management, operational and maintenance procedures
The project owner of each CPA will maintain a well defined management, operational and maintenance procedure that meets the requirement of the project activity to ensure successful operation of the CPA and the credibility and verifiability of the CERs tabulated. This includes:

Data handling

- Each CPA will develop and implement a data handling protocol that establishes a transparent system for collection, collation, computation and storage of data, including adequate record keeping, calibration and maintenance records
- Each CPA will maintain its own monitoring, data collection and record keeping system
- The CME will oversee and ensure that each CPA maintains the standardized monitoring, data collection and record keeping system, archives the monitored data in a secure database, and keeps the records for the entirety of the crediting period and two years after
- Data (paper and electronic) will be transmitted semi-annually to the CME for data audit, compliance review and preparation of monitoring reports

Quality assurance

- Key personnel will be assigned for overall project management, operation, monitoring and reporting
- Key personnel will also be appointed as the person-in-charge of and be accountable for the generation of monitoring reports, including data audit and verification, computation of emission reductions and necessary record keeping.
- A set of well defined protocols and procedures, with verifiable data entry, extraction and reporting to maximize transparency of data monitored

Training

- Routine training for new and existing staff is made regularly to refresh and upgrade the necessary operation, monitoring and maintenance know-how. Initial staff training will be provided prior to the start of any new operating CPA.
- Other necessary training beneficial to the development of the staff will also be included, such as Environmental, Safety and Health and Verification Processes.

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and monitoring methodology was completed on 11 January 2011, prepared by:

Gerald Peter Hamaliuk, Chief Technical Officer
Genpower Carbon Solutions L.P.

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is used for this PoA

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

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